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NEW ZEALAND
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Cover

Harvesting maize with a self-propelled picker. Maize is the highest yielding of all the cereal crops grown in New Zealand, upward of 120 bushels per acre being common in suitable conditions. Considerable increases in yields have been obtained in the last 15 years through the use of double-hybrid seed.

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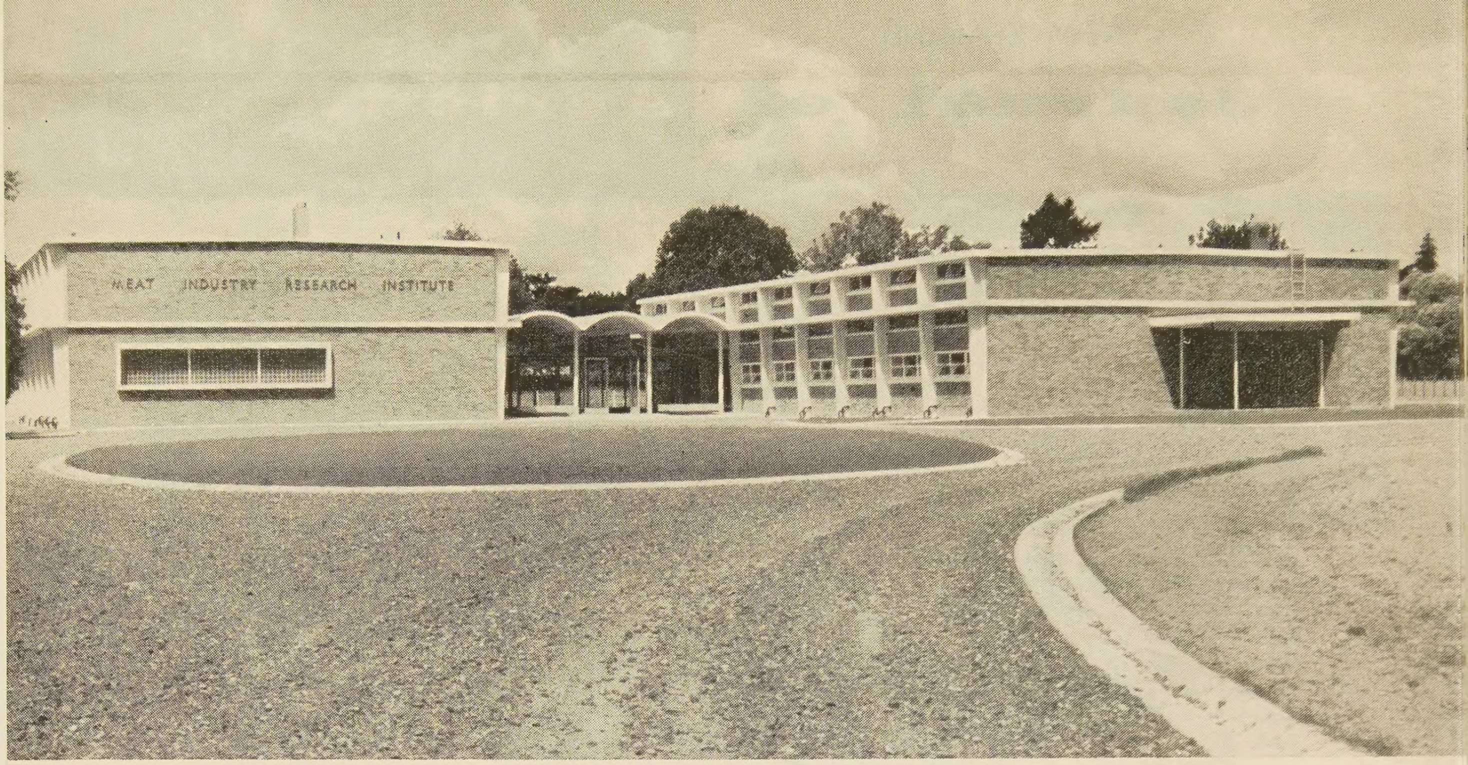


New Meat Research Laboratories Opened at Hamilton

HAILED by leaders in the meat industry, in other branches of primary production, and in agricultural science and extension services as promising marked benefits to the production and marketing of livestock products, the new laboratories of the Meat Industry Research Institute of New Zealand were officially opened at Hamilton on 4 March by the Governor-General, Viscount Cobham.

THAT the establishment of this new research association is of interest and value to a far wider community than the industry it serves was evident from the widely representative gathering of guests at the opening ceremony and at the reception afterward at the Farmers' Conference Hall of the Ruakura Animal Research Station.

Three years of intensive planning and effort have resulted in what the Director of the Institute, Mr N. H. Law, described as "one of the finest laboratories in the country".

"The establishment of the laboratories at Hamilton is a further step in making this city one of the major centres of research and education in this country", said Mr Law in his foreword to a commemorative booklet. "It is my hope that the Institute will acquire, in its field of scientific research, a reputation of which Hamilton, and indeed New Zealand, can be justly proud."

Established on 7½ acres of Ruakura land made available to the Institute at a peppercorn rental on lease in perpetuity, the laboratories are in what will be an impressive setting of lawns and long-established trees planted when Ruakura was a Farm of Instruction.

Those who inspected the buildings, plant, and facilities on opening day were impressed with the blending of the aesthetic with the utilitarian. The building is of two blocks offset one to the other and connected by a foyer. Provision has been made for extension of each block. Major external walls are of brick.

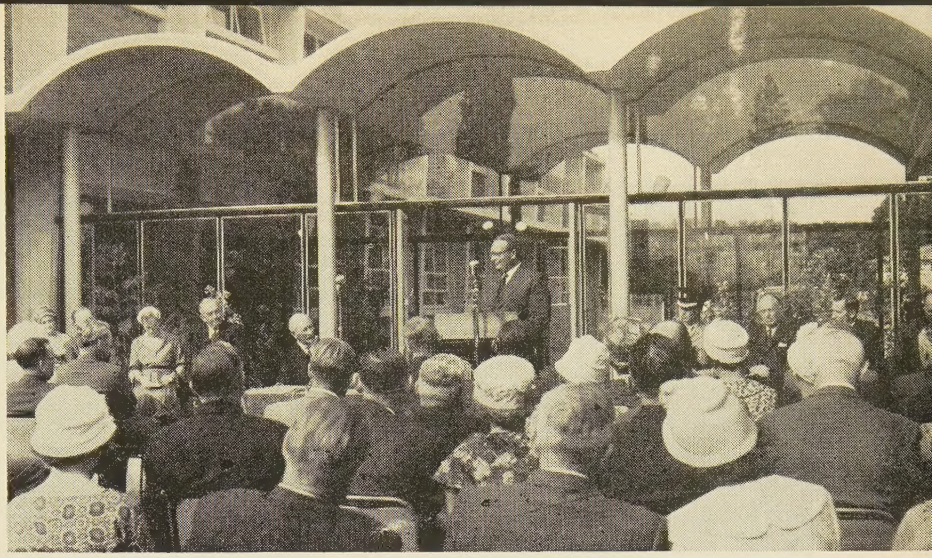
Sir Walter Mulholland: Over 50 years' pushing for organised meat research.

Development of the grounds, which is already well advanced, promises early mellowing of the new buildings into their own setting and into harmony with the nearby block of Ruakura administrative and laboratory buildings and the Farmers' Hall.

Origins of Institute

Need for a meat research unit has been recognised for many years. Sir Walter Mulholland, chairman of the Institute, remarked at the opening ceremony that though the export meat industry had been founded on the scientific discovery of refrigeration, it seemed a little strange that only now, nearly 80 years after export operations began, a laboratory of this nature was being built. Right from the beginning there had been a very constant call on science by the industry, but not in the cooperative and organised form that the Institute would take.

"What we are doing today is of great and immediate importance to the whole of our people," said Sir Walter. "Our selling slogan has been that New Zealand lamb is the best in the world. We don't want that to be at any time an idle boast; it never has been. The object of this Institute is to make that a scientific fact as long as we have to trade in meat overseas."



The Governor-General, Viscount Cobham, addressing guests at the opening ceremony from the foyer of the new Institute laboratories.

Tribute to Sir Walter's having pushed for organised meat research for over 50 years was paid by Mr J. D. Ormond, chairman of the New Zealand Meat Producers Board. There was a new outlook on marketing, said Mr Ormond, which was going through a revolutionary stage, an era of the supermarket, prepackaging, "portion control", and increased eating in restaurants.

"This revolution calls for new requirements, new ideas, and new methods. There can be no progress without research. Efficiency of meat research should be the greatest 'must' in the country."

Preliminary discussions on the formation of a research unit were held in 1946 and 1947 when the end of the Bulk Purchase Contract covering the supply of New Zealand meat to the United Kingdom Government was in sight and it was realised that maintenance of the quality of meat would be a decisive factor in the fierce competition that could be expected when meat marketing was restored to the trade.

Executive of the Institute

THE executive of the Meat Research Institute, with the authorities by whom they were appointed, is as follows: Sir Walter Mulholland, chairman, Meat Producers Board; Messrs N. A. Thomson, deputy chairman, H. Crichton, and P. Borthwick, North Island Freezing Companies' Association; Messrs R. D. Iles, W. Cleland, and V. Vial, South Island Freezing Companies' Association; Messrs J. W. de Gruchy and A. P. O'Shea, Meat Producers Board; Drs W. M. Hamilton and J. C. Andrews, Minister of Scientific and Industrial Research; Dr C. P. McMeekan and Mr I. G. Watt, Minister of Agriculture; Mr N. H. Law, Director; and Mr J. B. Walton, secretary. Past members of the executive are Drs M. M. Burns and J. F. Filmer, appointed by the Ministers of Scientific and Industrial Research and Agriculture respectively.

In 1955 the Meat Industry Research Institute of New Zealand was registered as an incorporated society with an executive comprising representatives of the Departments of Scientific and Industrial Research and Agriculture, the North and South Island Freezing Companies' Associations, and the Meat Producers Board.

The Research Programme

Research began in temporary premises in Wellington in 1957.

The Institute's research is more general or fundamental than can be undertaken by scientific staffs of freezing works. It therefore does not duplicate an existing service but provides an organisation through which the industry may reap the full benefit of scientific knowledge.

The aims of the Institute are "To foster, promote, and undertake research in meat and the meat industry, and all matters appertaining thereto, whether in New Zealand or overseas".

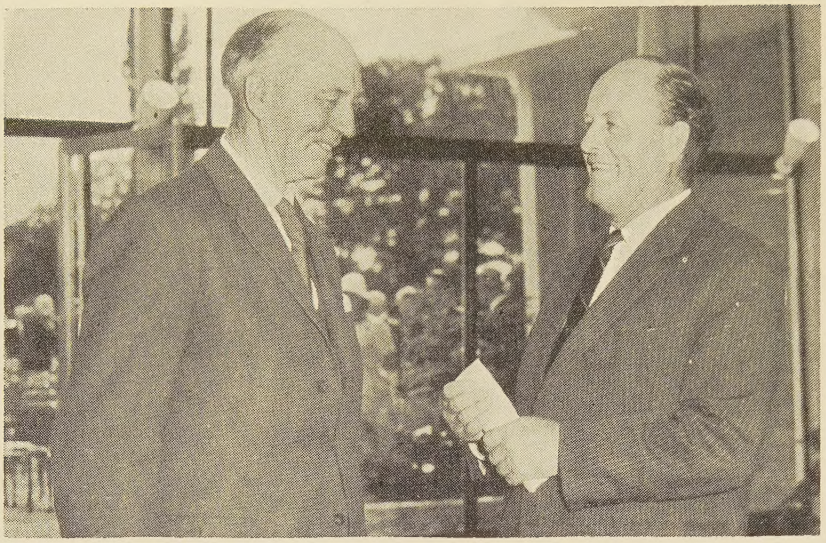
Microbiology, biochemistry, engineering, and technical development sections have been established. The first three have been operating for four years and the fourth will begin shortly. To cope with increased work in the new laboratories, present staff of nine is expected to be increased to 20.

Microbiology Section: Study of microbial spoilage of meat and meat products is a major project of this section. To study the effectiveness of methods now used or being considered in works to achieve the highest possible standards of hygiene, a survey of the bacterial populations of freshly prepared meats of various types is being carried out. It is hoped to set tentative bacteriological standards for meat quality on the results of the survey.

The distribution of organisms that can cause particular types of spoilage is being studied. An example is "bone taint" or deep spoilage in beef. The salmonella organisms, which are a potential cause of food poisoning, have been specially studied and possible sources of animal infection are being investigated. In addition to seeking ways to reduce the incidence of salmonella in living animals, the effects of freezing, heat, and irradiation on salmonella are being investigated with a view to killing the organism in meat.

Microbiological processes of waste disposal in the meat industry are also being investigated.

▼ The Director of the Institute, Mr N. H. Law, at work in one of the new laboratories.



The Minister of Agriculture, Mr W. H. Gillespie (left): The Government is a partner in the Institute project. Mr J. D. Ormond, chairman of the Meat Producers Board (right): Efficiency of meat research should be the greatest "must" in the country.

Biochemistry Section: This section's research into the chemical and physical nature of meat includes study of the mechanism of muscular contraction of meat, to which tenderness is closely related. It is planned to investigate further the tenderisation of meat during ageing and the influence of freezing rate on the palatability and tenderness of meat. Other investigations of muscle mechanism are closely related to the study of "drip" formation in meat.

Staff of the Institute

THE staff of the Meat Research Institute is: Mr N. H. Law, Director; Drs B. B. Marsh, R. H. Locker, and C. L. Davey, biochemists; Dr P. M. Nottingham, microbiologist; Dr R. L. Earle, chemical engineer; Mr R. V. Stafford, technical officer; Miss E. Cooper, technician; and Miss M. R. Mankelow, secretary.

For a full understanding of the biochemical nature of muscle tissue and of the factors affecting meat quality, studies of metabolic reactions that occur in the animal after slaughter are necessary, and radioactive tracer studies will be carried out on this project.

Engineering Section: This section is concerned with the application of physical and chemical principles to meat processing, freezing, storage, and distribution. A formula has been developed that relates the time required to freeze a block of meat to carton dimensions and freezer temperature, which is basic data essential to the efficient operation of plant.

The section is equipped to investigate new processes, plant, and materials. Testing, development, and pilot plant operation can be carried out more easily and comprehensively than is practicable in works. Topics for study include the rendering process for animal fats, drying procedures for manures and other products, and the development of improved refrigeration plant.

The section will keep works technical staff informed of new engineering trends and developments and investigate aspects of refrigeration that affect the efficiency and economy of plant operation.

Technical Development Section: Plans for this section, which is about to begin working, include investigations to improve the processing of by-products and to establish the conditions required in cutting rooms to keep shrinkage losses to a minimum, which is part of a project to study the evaporation of water from meat surfaces which causes losses of bloom and salable weight.

With the Institute now fully operative in its own excellently equipped laboratories, New Zealand joins the United Kingdom and Australia among Commonwealth countries with established meat research groups. In Canada the National Research Council and in India the Council for Scientific and Industrial Research maintain steady research interest in meat. Concern that there should be frequent consultation by meat research workers in Commonwealth countries was expressed by Dr J. R. Vickery, Chief of the Division of Food Preservation of the Australian Commonwealth Scientific and Industrial Research Organisation, who was a guest at the opening of the Institute. "If arrangements can be made for these meetings," he said, "not only will the research programmes in each country be stimulated through an exchange of ideas, but, as need arises, cooperative research programmes may be devised where joint work by two or more countries may accelerate the solution of some major problems affecting each."

Chatham Islands to Have Farm Advisory Officer

CHATHAM ISLANDS are shortly to have a resident Farm Advisory Officer, the Minister of Agriculture (Mr Gillespie) announced recently. Mr S. H. Henry, at present the Department of Agriculture's Farm Advisory Officer at Stratford, has been appointed and is expected to take up the position early this month.

There was great scope for farm improvement on the Chathams, said the Minister, and though specialist officers who visited the islands from time to time had been able to give settlers a good deal of assistance, the Government believed that farmers there were entitled to the full-time services of an experienced instructor. However, before he could be appointed a suitable residence had to be built. Materials for this and labour to construct it had to be brought from the South Island.

Some pasture trials had been laid down by the Department and a farm improvement demonstration begun. The resident advisory officer would be able to expand such investigations and examine closely all aspects of farming development.

For some years, said the Minister, Mr E. A. Madden, Farm Advisory Officer (Agrostology), an officer with very wide experience in land and pasture improvement, had made annual visits to the Chathams. He had been able to set a good deal of improvement in train and offer advice on the best way of tackling local farming problems.

Because of Mr Madden's long association with the islands, he will assist Mr Henry in planning a programme.

Use of Spinner Surface-drain Digger in Auckland Province

By D. F. SCOTT,
Instructor in Agriculture, Department of Agriculture, Auckland

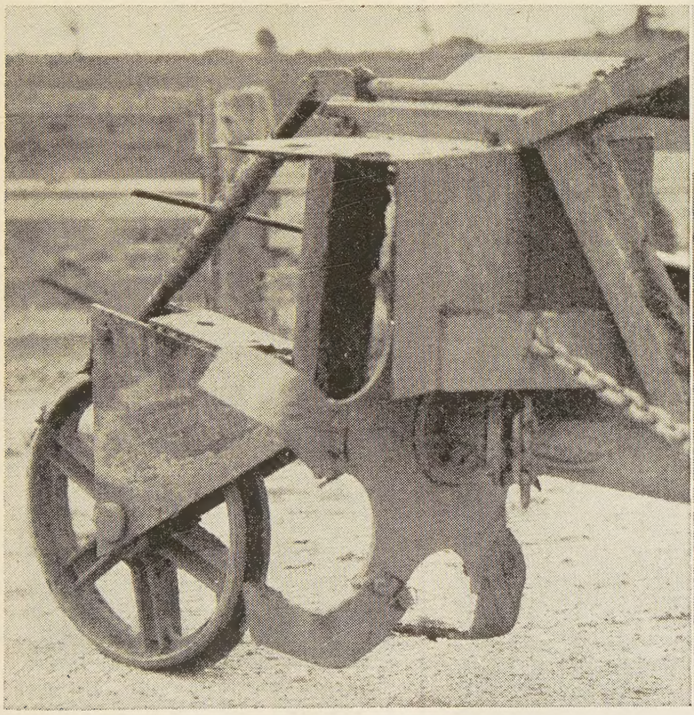
A FARM-BUILT spinner type of surface-drain digger that has been popular with a number of farmers on the West Coast of the South Island was described in the "Journal" of August 1940 and again in the February 1960 issue. From an illustration it was apparent that a machine of this type should have wide uses for numbers of farmers working wet country in Auckland Province.

THOUGH there is no doubt that generally surface-drainage methods are inferior to underground-drainage methods, occasionally for reasons of cost or outlet or soil difficulties surface methods are justified. This is the case in a number of areas in the Auckland district.

Old Surface-drainage Method

On the Hauraki Plains and other marine flats in Auckland Province a very old practice of preparing the surface of the land in a series of parallel ridges and hollows has become popular. The surface drains, often called humps and hollows, have the advantage that they are cheap to install and require no great depth of outlet, and yet are very effective in aiding the run-off of surface water and so providing some surface drainage.

One problem of this method is that the ridges drain into the hollows, which tend to remain rather wet and often suffer from pugging and rush and other weed growth. As in every case the fall available for the surface channels is very limited, it is important that they be kept free of these obstructions to allow reasonably quick discharge of water. This can mean that the hollows require regular cleaning. Though this cleaning can be partly mechanised by the use of road graders or tractor-mounted grader blades or a plough or can even be done by hand, in each of these methods the spoil removed by the cleaning operations is left as a ridge or series of heaps along one or both sides of the surface channel. Obviously this is most undesirable, as it tends to prevent water getting into the channels and can defeat the whole purpose of the system.



Conventional rotary hoe blades work very well on the spinner and have the advantage that replacements are readily available.

The spinner so widely disperses spoil from the drain that there is no ridge at the edges as with other, conventional methods; it will also remove blockages caused by trampling of grazing animals.

New Type Spinner Designed

What is required is a cleaning method which removes the spoil completely from the border of the drain. While this could be partly achieved by chemical sprays, this method deals only with vegetation, and some mechanical means is still required to remove surface blockages caused by trampling of grazing animals. It appeared that the West Coast type of spinner would be suitable, and accordingly arrangements were made with a local machinery manufacturer to design a prototype spinner based on the idea of the West Coast machine but suitable for attaching to as many of the current farm tractor models as possible.

After the construction of several prototypes a machine has been produced that appears to fulfil these requirements very well. In an effort to make it more suitable for use with tractors travelling slightly faster than some of the machines used on the West Coast, the number of blades was increased to six, and it was found that the conventional rotary hoe blade worked very well on the spinner and had the advantage of availability should replacements be necessary due either to wear or breakage. To help to guard against damage to the spinner blades a protective device in the form of shear pins was provided.

Though the West Coast machines were mounted behind the tractors and pulled as trailed machines, it was decided for a number of reasons to mount the production models of the new machine on the hydraulic linkage, the main ones being ease of transport and the ability of a hydraulically supported unit to cut a channel right up to the edge of an existing open drain.

While many of the surface drains dug on flat country are straight, some are not and curve to follow hollows or old watercourses. For cutting these the machine must be able to deviate from a straight line while still cutting.

Use on Rolling Country

On rolling country where conventional under-drainage with moles or tiles cannot be used surface channels at regular spacing on gentle grades have proved to be worth while. Much of such work has taken the form of graded banks made as part of a soil conservation plan to check erosion and conserve moisture. For these purposes the channels are planned on flattish gradients to prevent scouring and to allow the water to soak into the soil as much as possible.

If, however, the aim of the planner is to improve soil drainage, the surface channels may be planned on a steeper grade to accelerate water disposal. Experience has shown that channels can be used on grades of 1 in 40 or 1 in 30 without any scouring provided the catchment area of any one drain is limited.

The spinner has been used successfully to dig this type of drain, and though the capacity of the channel so formed is much less than that of the conventional graded bank, this difference can easily be made up by using more drains and by increasing the gradient, giving higher velocities and therefore greater capacity. As the channel formed by the spinner offers little obstruction to the passage of animals or vehicles, there is no objection to the greater intensity of the smaller drains.

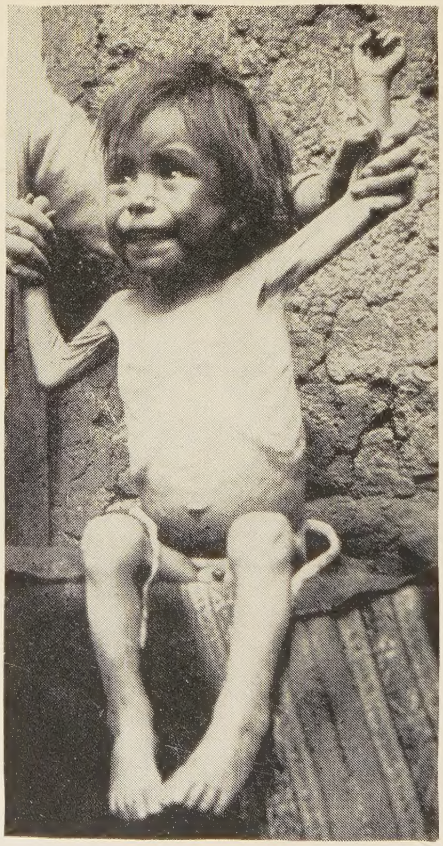
An important advantage in the use of steeper gradients is that they simplify survey problems. A very simple levelling technique using an Abney level gives ample accuracy. So far there is no evidence of any scouring in the channels, even though these have not been grassed. If it is ever desirable to increase the capacity of the channels formed by the spinner, there appears to be no reason why the soil cut from the channel should not be deflected to form a ridge along the lower side of the channel.

The fact that the smaller channel could easily be blocked by relatively small displacements of earth is not considered important because of the ease of cleaning with the same machine that was used to dig the drains in the first place.

Experience during the last year or so indicates that this relatively simple machine can do an excellent job both in digging and in cleaning surface-drain channels on either flat or rolling country.

Freedom-from-Hunger Campaign

"Millions of people still go hungry in the world, or at least do not have a proper diet to sustain their health, growth and vigour. The causes of this state of affairs, though complex, are well-known. But experience proves that they will not be corrected fast enough, so long as the problem is not given the full attention which it deserves. Concerted action is required on a world-wide front and the purpose of the Freedom-from-Hunger Campaign is to mobilise on a voluntary basis and co-ordinate the efforts of all those who are anxious to contribute to such action."
—Principles and Methods Governing the Freedom-from-Hunger Campaign.



In most countries → where there is malnutrition mothers and children suffer most. The little boy is from Latin America and is a victim of undernourishment and lack of protein.

WHAT will be New Zealand's annual demand for agricultural graduates during the next quarter century?

What sort of jobs will these graduates get, and how should they be trained to be well fitted for them?

What type of agriculture will the graduates be expected to service in 25 years?

THESE questions were asked and discussed by Dr A. Stewart, Principal of Massey Agricultural College, in his presidential address to the annual conference of the New Zealand Society of Animal Production at Ruakura Animal Research Station, Hamilton, in February.

[*Elmar*

Dr Stewart: The animal I have chosen to discuss in the field of animal production is the human, the productive capacity of which is determined very largely by the educational processes to which it is subjected.

Dr Stewart of Massey Discusses

HIGHER AGRICULTURAL EDUCATION

as a Factor in Animal Production

"THE answers to these questions are needed for us to plan efficiently for the future, and since they are not likely to be known until the period has almost elapsed, we must rely on educated guesses.

New Types of Jobs

"My opinion is that probably one-third or more of our students will be employed in types of jobs in 25 years' time that do not now exist. Even in types of jobs that do exist today one cannot estimate the need for trained personnel in 1985 from the level of demand in 1960.

"The speed of the technological revolution we are witnessing is accelerating, and the need for technologists and technicians increases year by year. There may be some who feel that we have reached a plateau of technological achievement from which we can advance only slowly and therefore that we have little need for more technologists. I can see no evidence of this.

"On the contrary I think we are on the threshold of major advances which will be realised when we bring under control some of the sources of power which at present are almost within reach. The new potentials in agriculture, however, will be realised only if there are adequate graduates available to capitalise on the fresh opportunities as they appear.

"For our own domestic needs I foresee increasing demands for the products of the agricultural colleges which we will be unlikely to meet for at least the next decade. When to this local need are added the requirements of overseas countries, I am confident that the 100 agricultural graduates which New Zealand will be producing each year from 1964 onwards (in contrast with the total of 20 per year hitherto) need have no fear of unemployment nor that they will not be making a worthwhile contribution."

Dr J. F. Filmer (left) and Sir Bruce Levy (right), who were elected honorary life members of the New Zealand Society of Animal Production at the Society's annual meeting in February. Dr Filmer has been a member for the 21 years of the Society's existence and is a past president. His and Sir Bruce Levy's outstanding contributions to the proceedings of the Society were referred to by the president, Dr A. Stewart.

Rising Enrolments

Some of the reasons advanced by Dr Stewart for the phenomenal rise in enrolments at the agricultural colleges during the last three years were:

1. The increase in the birth-rate from the low point of the depression years to the increasing rate of the early war years contributed a little, but the full effects of the "rising tide" would not be felt until 1963 and 1964.
2. Approximately one undergraduate in six at Massey College is from overseas—from Australia, South-east Asia, and the Pacific—and they have accentuated the natural increase. In 1960 Massey had almost as many overseas undergraduates (36) as its total undergraduate roll three years before.

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NEW FORMULA
UDDER INJECTION

Clear plastic, moisture proof container

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FOR MASTITIS

Any quarters which show signs of mastitis at drying-off and those which have shown infection during the season should be given three tubes of Adpen 100,000 strength at 24 hour intervals, the last tube after the final milking as the cow is finally turned out.

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The Importance Of Care In Drying Off

It has been estimated that mastitis accounts for more than 50 per cent of the total losses brought about by dairy cow diseases and this figure in £. s. d. is astronomical.

The preventive measures to combat this disease require a rigid system of shed hygiene, examination of pre-milk from each quarter for any abnormality and prompt use of penicillin at the required dosage.

Unfortunately the bacteria associated with mastitis may appear in the milk some time before exhibiting any symptoms apparent to the naked eye. It could therefore quite easily result in a cow being a carrier of the disease without the milker being aware of it.

When the time comes for drying off the herd it is a matter of good animal husbandry to consider every cow as a suspect carrier of mastitis and a wise precaution after the last milking would be to inject penicillin cream into each quarter before turning them out. It should be understood that the penicillin remains concentrated in the udder for a much longer period than is the case with lactating animals.

The economics of this precaution are elementary. The cost of the penicillin required to treat all of an average size herd could be adequately covered if a quarter from one cow was saved during the next lactation. It is sound economy, therefore, to look ahead. Ensure that your herd comes in free of mastitis next season by injecting every quarter with Ad-pen penicillin plus as your cows are turned out.

* AD-PEN IS PENICILLIN PLUS: It is an improved combination of penicillin and a powerful anti-bacteria agent. This combination is effective against a much wider range of bacteria than penicillin alone, and is also effective against many cases of stephylococcal mastitis, which are resistant to the ordinary penicillin treatment

3. The sudden popularity of university education had had a very marked effect. This should not have been unexpected if the increasing popularity of secondary school education over the last 15 years had been noted.
4. Perhaps as important as the last reason and applying only to the agricultural colleges had been the provision of pure science teaching with hostel accommodation in an agricultural environment for first-year students. This appeared to have encouraged into professional agriculture many country youths who previously were reluctant to attend the crowded city universities and live in "digs".

The phenomenal growth in student enrolments was illustrated by Dr Stewart in terms of second-year degree students. The 1945-57 average second-year class was 15, with the number down to two in 1955. In 1958 there were 26 second-year degree students; in 1959, 43; in 1960, 62; and the estimate for 1961 was at least 75.

Officers of Society of Animal Production

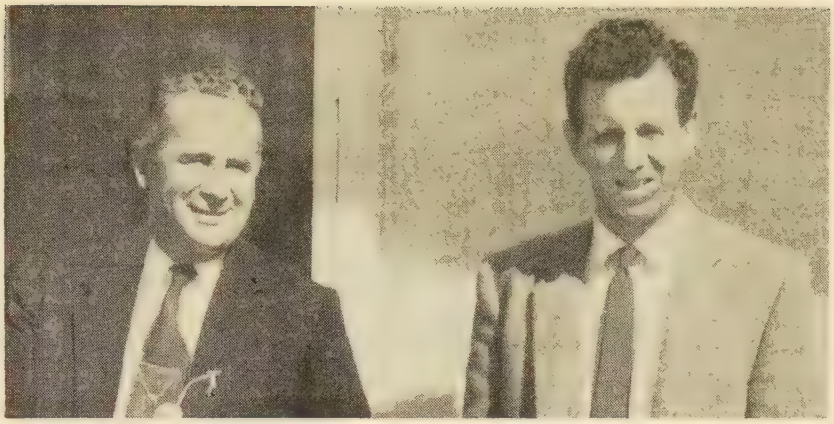
THE following officers were elected at the annual meeting of the Society of Animal Production: President, Dr D. S. Flux, Massey Agricultural College; vice-president, Mr E. D. Andrews, Wallaceville Animal Research Station; committee members, Dr A. Stewart (immediate past president), Massey Agricultural College, Dr J. B. Hutton, Ruakura Animal Research Station, Dr A. H. Carter, Ruakura Animal Research Station, Mr J. W. Stichbury, New Zealand Dairy Board; secretary-treasurer, Mr D. C. Collis, Massey Agricultural College; editor of proceedings, Mr A. G. Campbell, Ruakura Animal Research Station.

The Society's 1962 conference is to be held at Massey Agricultural College, Palmerston North.

"A five-fold increase in four years has educational implications which are only now being thought out," said Dr Stewart. "There is considerable strain because of lack of equipment and accommodation and also because we are having to develop new educational methods appropriate to large classes."

Other more fundamental aspects of technological education which deserved attention related to course content, said Dr Stewart.

"The first is: How can we cram into the minds of our students all the extra knowledge that is the result of recent scientific achievement?



Mr E. D. Andrews (left), vice-president elect of the Society of Animal Production, and Dr D. S. Flux (right), president elect.

"The second is: Should we provide a general component in the agricultural undergraduate course which will encourage in our students an interest in the humanities?

Mathematics Important

"In respect of the first—coping with all the extra knowledge—the answer appears to be a very much greater concentration on mathematics from an early age. The two great instruments that have been devised for understanding the world are words and numbers. Our schooling to the age of 18 emphasises the verbal disciplines. Years are spent in teaching languages, and while I appreciate that words must be used with precision so that the statements they comprise are meaningful, I think it more important to train young minds to think logically.

[*Niederer*

Mr D. M. Smith, Senior Principal Scientific Officer, Ruakura Animal Research Station, who has resigned from the Department of Agriculture to enter a partnership in a commercial pig production project in Queensland. Mr Smith has been in charge of pig research at Ruakura for many years and was responsible for the research programme for development of the hybrid sow. He has recently been experimenting with incorporation of the Landrace breed in this programme.

"Because mathematics is exact and, unlike language, has no irregularities, it is more readily absorbed. It makes demands on reason rather than on memory, and, all other things being equal, it appears that those well trained in mathematics are able to assimilate greater quantities of scientifically based information than those who are not so well trained.

"But at Massey we have students commencing our degree courses with only vague notions of mathematics. Are we to repair these omissions at Massey with formal courses in elementary mathematics in already crowded curricula?

"The real need is for our students to commence their agricultural course at least competent in sixth form mathematics and prepared to advance still further. Quite apart from the intrinsic value of mathematics, in view of the extensive use made of them in the undergraduate course there is a growing body of opinion in favour of Mathematics I at least being taught as an integral part of the agricultural degree."

Broad Cultural Base

The need for technological courses to be designed to meet the danger of narrowness and "cultural" starvation as a result of the specialisation which

Next to his Prize Stock
the Farmer Prizes his

MARATHON
Gumboots
BY SKELLERUP

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The farmer looks upon his Marathon Gumboots as essentia pieces of equipment . . . they are the toughest, mos comfortable gumboots he can buy. Because of the EXTRA laminated reinforcing that is built into Marathon Gumboot —they outlast all others

MARATHON
BY SKELLERUP
MARATHON
BY SKELLERUP

One of the cows from Mr A. D. McFadden's pedigree Friesian herd.

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takes place or should take place at the university was the second aspect of course content referred to by Dr Stewart.

"Many will hold that it is the function of the secondary schools to provide the broad cultural base which will develop subsequently in extra-curricular activities at the university. Unfortunately the secondary schools do not always provide this broad base, and university special schools may, because of their isolation, be remiss in their provision of extra-curricular cultural activities.

"In such cases should formal courses in general education be provided? Two or three hours' instruction each week in the humanities may find response in the most unexpected quarters. Just where compulsory courses in 'culture' can be fitted into a programme already overcrowded and now threatened with mathematics is a problem. It is one, however, that we must face up to.

"Though some employers of our graduates will be concerned mainly with their academic attainments, there will be a number to whom personality and breadth of interest will mean a great deal provided the graduate has shown reasonable competence in his formal courses. Further, the graduates themselves are likely to derive a great deal more from life if they have an appreciation of interests other than their own narrow professional ones."

Though he had deliberately avoided the physical problems of accommodation, research facilities, and so on, said Dr Stewart, and emphasised instead the new things agricultural colleges might consider teaching in future to provide better graduates, it had to be stressed that any developments must depend on staff, which was likely to be a critical issue in the next 10 years.

"Some of the increasing numbers of people who are now passing through our post-graduate classes may then be ready to join the teaching staff. In the meantime as an interim measure the shortage of staff can probably be made up only by placing more and more reliance on part-time teachers. But to ensure that we attract the best of the students at present passing through our graduate classes back to the university, we must be prepared to see the responsible positions in the universities being better paid than their equivalent non-university positions. It is axiomatic that the best men should be attracted back to the university to teach the next generation."

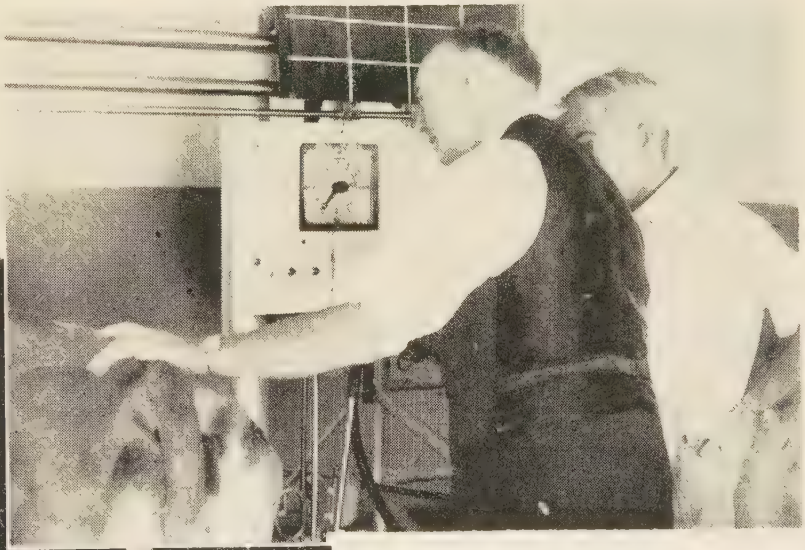
Minister Looks at Ruakura Research

"I'D like to see how some of these would do on my place in North Canterbury" was the practical comment of the Minister of Agriculture, Mr W. H. Gillespie, on vealers by beef bulls out of dairy cows that are being reared at Ruakura Animal Research Station in crossbred beef investigations there.

IN Hamilton in early March for the opening of the Meat Research Institute established on former Ruakura property, Mr Gillespie had discussions on agricultural research with the Director of Ruakura, Dr C. P. McMeekan, and inspected some of the research projects at the Station and the site of the new Waikato University to be built on 130 acres of the Station that have been ceded to the University of New Zealand.

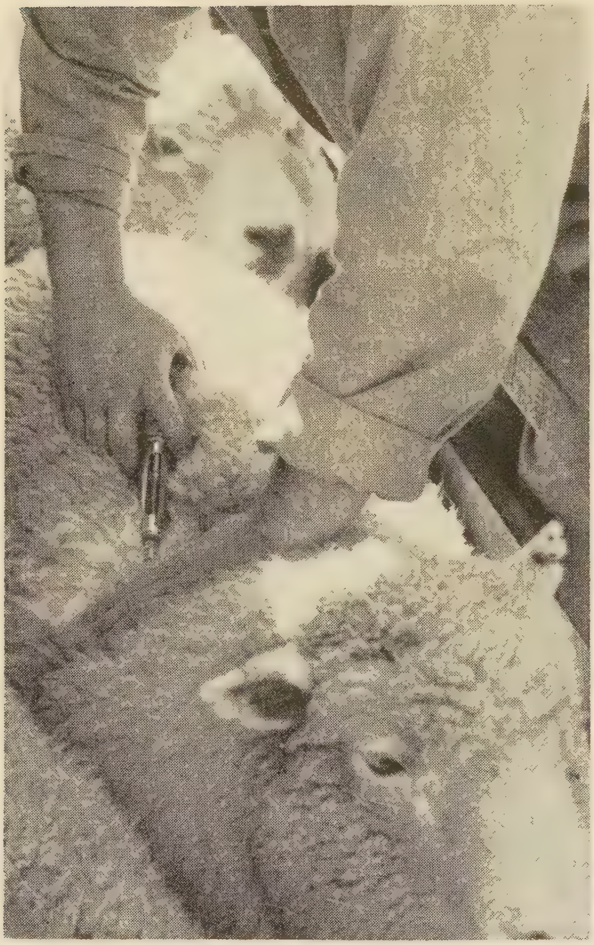
A property adjoining Ruakura that has been taken over by the Station in lieu of the land to be occupied by the university was also seen by the Minister, who discussed with Dr McMeekan and some of his scientific staff proposals for the new dairy being built to replace that on the university site and to continue investigations into dairy cow nutrition.

▼ The Minister hears from Mr D. S. M. Phillips, Ruakura physicist, how the Station, largely with equipment adapted or developed at Ruakura, is trying to find and measure the factors in milking management that affect production. A recent outstanding attainment has been a 32 per cent improvement in production of the herd in Mr Phillips's dairy by application of a 30 seconds pre-milking stimulus.



← "A hundred thousand tons of beef—the potential of cross-breeding for beef production in the dairy industry—are going to waste every year" is Dr McMeekan's conclusion from Ruakura research he explains here to the Minister. "One day the idea will come off," says Dr McMeekan, "particularly if dairy prices come down."

Care of Livestock during May



By Wallaceville and Ruakura Animal Research Stations

BLOOD POISONING IN HOGGETS

BLOOD poisoning in hoggets grazing on turnips is becoming an increasingly important problem. Deaths occur from infection with the blackleg organism, which probably gains entry through the mouth. An excellent vaccine which confers very good immunity can be bought in New Zealand. On properties where losses have previously occurred hoggets should be vaccinated at least a fortnight before they are placed on turnips. The nearest Veterinarian or Livestock Instructor should be consulted about the method of vaccination.

PREVENTION OF SUCKING BY CALVES

Sucking of each other by calves is a habit which should be broken as soon as it is detected. The insertion of a bull ring is effective in most cases.

MILKING MACHINE OVERHAUL

As soon as the cows have been dried off arrangements should be made for the milking machine to be overhauled by an expert. Do not install complicated gadgets, but make sure that all parts of the machine are working efficiently. This will not only ensure rapid, trouble-free milking, but is likely to increase production and will help to reduce mastitis.

INOCULATION OF DOGS AGAINST DISTEMPER

Distemper in dogs can usually be prevented by vaccination. This is best done when the pups are three to four months old.

RED WORMS IN HORSES

Red worms can seriously reduce the efficiency of working horses and are responsible for many deaths in foals.

Phenothiazine is a very effective remedy, but is best given under veterinary supervision, as in certain conditions it may prove dangerous. Animals should be treated before winter.

UNTHRIFTY CALVES

The best feed for calves is good fresh pasture, and this can be provided by rotating the calves through the cow paddocks. Good-quality hay is necessary to supplement the sappy young autumn pasture. At the first sign of unthriftiness calves should be drenched with phenothiazine, being given the full dose recommended on the label. Drenching, however, will not be effective unless the calves are properly fed.

AUTUMN-SAVED PASTURE

In most districts there is still time to provide good winter grazing by shutting up paddocks and letting them grow during autumn and early winter. Having some pasture cover on paddocks before the first frosts will assist pasture growth during winter. Autumn-saved pasture is invaluable for early calving cows. It also provides the best insurance against sleepy sickness in ewes. If necessary, feed silage to cows now to enable some paddocks to be shut up. Once the ewes have been tupped they are all the better for being done fairly hard until three or four weeks before lambing. This also will enable some paddocks to be spelled.

Seasonal Notes

By Farm Advisory Division

KEEPING ELECTRIC FENCES WORKING PROPERLY

AS many electric fences are erected during winter, it is easy for a farmer to overlook the fact that pastures often bolt away during summer and a thick band of strong-growing grass can absorb much of the current flowing along the wires. With tall summer growth but little bottom growth power loss may be slight, but if the pasture is strong and green, serious trouble may occur.

Harder grazing of paddocks bounded by electric fences may solve the problem, or the second to bottom wire may be insulated separately and disconnected when overgrown. Electric fencing should be used only where it is certain to work properly.

Instruments that are being developed for measuring the loss of current through obstructions, grass, and faulty insulation will enable a farmer to test a fence from one or two points, instead of having to patrol the whole length to find faults. When buying a tester remember that you need an instrument that is easy to read and strong enough to remain accurate despite constant handling.

—*R. G. WARREN, Dannevirke*

* * *

WINTER FEEDING AND PASTURE MANAGEMENT FOR THE EWE FLOCK

SINCE there are few areas in the South Island where ewes can be satisfactorily wintered without providing supplements, stock should be taken now of the feed on hand and a programme of feeding decided on which will make the best use of the total feed available.

A diet which maintains body weight during winter while conserving sufficient high-quality feed to maintain a similar level of feeding during the last five weeks of pregnancy should be aimed at.

Green feeds, new grass, autumn-saved pasture, and the pick of the hay crop should be conserved for this critical period. If strictly rationed, they will provide adequate feed beyond that time. Poorer-quality feeds are best used earlier in winter.

Shortage of suitable feed at lambing often results from inefficient utilisation in early winter. Grass supplies just before lambing largely depend on the autumn growth which has been conserved before flushing and immediately after tupping. Closing of pasture then and strict rationing during winter are the best means of ensuring adequate feed at the right time. —*M. L. CAMERON, Timaru*

* * *

PLAN FOR EARLY SPRING GRAZING NOW

THERE are numerous systems of wintering, but most farmers have accepted the principle of saving autumn pasture growth for winter and spring use.

Toward the end of tupping ewes can be put on a reduced plane of nutrition and fed hay or used to clean up areas of rough grazing. Good-quality pasture thus saved should last from about four weeks before lambing until the spring flush of growth. In April and May dairy herds are drying off and will do just as well on silage supplemented by a limited amount of pasture as on an all-pasture diet. By feeding out now and closing most of the farm enough grass can be saved to last from shortly before calving until spring growth starts.

In warmer districts where there is good winter and early spring recovery after grazing, the first grazing of autumn-saved pasture should finish about a month before spring growth begins. The more nutritious, early spring regrowth can then be grazed when the herd is reaching a peak of production and when feed requirements are consequently highest.

Supplements such as silage, hay, or crops should be used from now until about two weeks before calving, but some silage should be reserved if possible to supplement the second grazing from saved pasture in case bloat should occur then. —*B. A. GUNNING, Matamata*

* * *

MAINTENANCE OF LUCERNE STANDS

MANAGEMENT of established lucerne stands between the last cut of the season and late winter should aim at allowing the lucerne plants to replenish plant food depleted from the root system during the previous season.

Potassic-superphosphate mixtures are best applied after the first spring cut, but where phosphate in the soil is naturally low superphosphate applied in autumn is beneficial. Lime requirements of lucerne stands are higher than those of pasture, and maintenance dressings are best applied in autumn also. Advice on fertiliser rates appropriate to particular soils can be obtained from farm advisory officers of the Department of Agriculture.

Very little weed control can be done until early spring, but judicious grazing in autumn can reduce weed competition with minimum damage to the lucerne. Frequent quick grazing by a high concentration of stock should be aimed at, but this should not be continued later than May.

—*H. J. JAGGER, Hastings*

* * *

NITROGEN AND AUTUMN-SAVED PASTURE

IN most districts there is still time to conserve autumn pasture growth for rationing in the critical late winter-early spring period. The younger pastures in good heart that carry a good proportion of short-rotation ryegrass and perennial ryegrass are most suitable. These paddocks should have a vigorous clover base to supply adequate nitrogen. In warm districts pastures shut at this time will still have six weeks of growth before winter. However, the colder districts have only a month to six weeks left before colder temperatures stop further growth. Nitrogenous manures at 2 cwt per acre will boost growth, and more nitrogen in the foliage will reduce frost burn.

However, the decision whether or not to use expensive nitrogenous fertilisers depends on the need for extra feed. Generally winter crops will be more economical and more reliable.

Apart from nitrogen, pastures to be shut for autumn-saved grass should have been adequately topdressed with superphosphate and also DDT for protection against grass grub. —*T. G. SEWELL, Gore*

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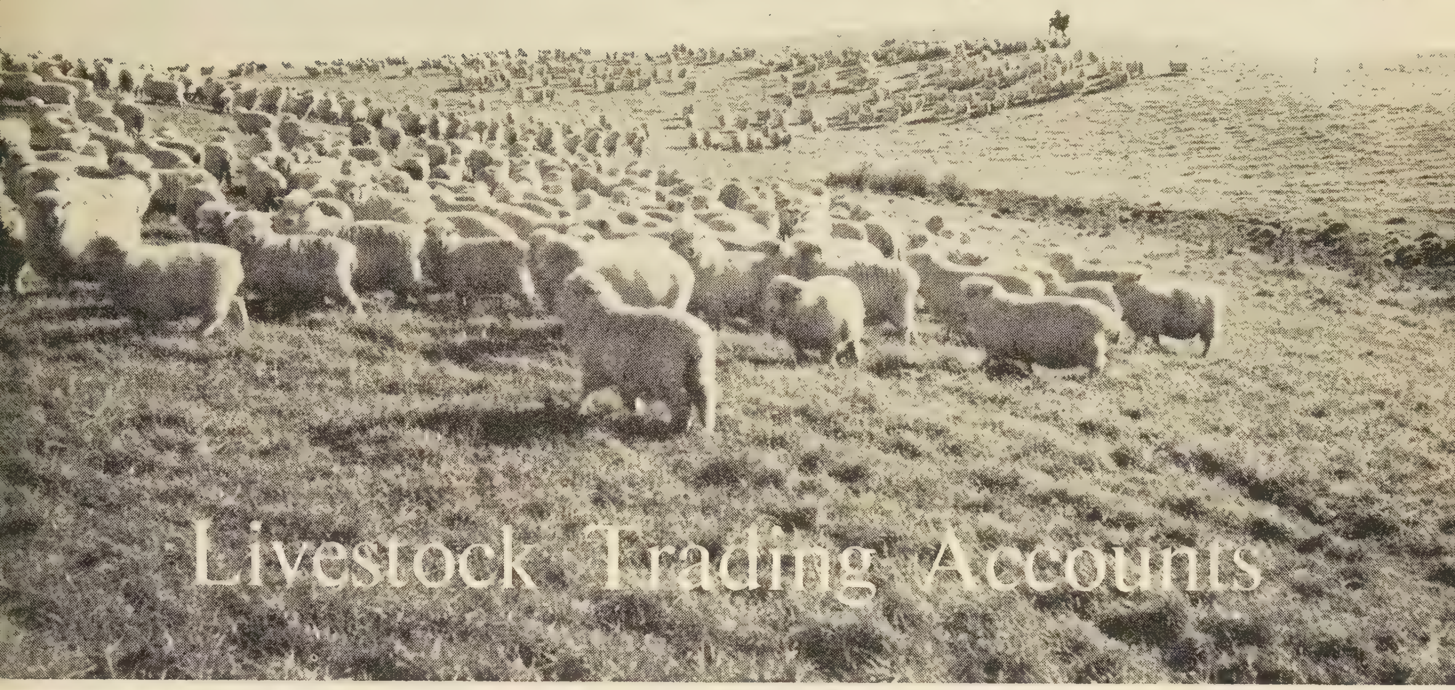
The Business Side of Farming



Livestock Trading Accounts

By R. J. TOWNSLEY,
Farm Advisory Officer (Economics), Department of Agriculture, Auckland

THE livestock trading accounts are an important part of the farm accounts, but the fullness with which they are presented and understood varies widely. If well set out, the livestock accounts can be a valuable record and farm management aid. However, a full livestock account can result only if the accountant is given accurate information. These accounts should be both a numerical and financial record of stock transactions for the year.

A LIVESTOCK account, in simplified form, is as follows:

Debit		Credit	
Opening livestock (1 July 1959)	—	Sales	—
Natural increase		Losses	—
Purchases ..		Killings for own use	—
		Closing livestock (30 June 1960)	—
Total all items		Total all items	

Total number of stock on the debit side must balance those on the credit side.

Within the above broad headings there are entered classes of livestock which vary, depending on the farming year being used and the simplicity required. For those farmers using a 1 July-30 June year the position is considerably simplified; for instance, on a dairy farm in June there will usually be on hand mature cows, including heifers which are due to calve in spring, yearling heifers, and bulls. At this time it is likely that all cull cows will have been sold. However, for a dairy farmer on a 1 April-31 March year the position is more complicated. On 31 March there will be on hand milking cows, heifers run with the bull, calves, and bulls. The number of milking cows on hand may depend on whether culling has been late or early in that year and this in turn may depend on feed supply, etc.

The same applies on sheep farms. If summer conditions on a fat lamb farm are poor, there are likely to be considerably more lambs on hand in March than in a good season.

Stock Must be Described Consistently

Whether the accounts are based on a March or June year, it is most important that the number and classes of stock be accurate and consistent. If sheep are described in one year as hoggets and, at the same time a year later, as lambs, an error can result. The accountant will most likely have different standard values for lambs and hoggets, and as his knowledge of farming may be limited, he is unlikely to question a farmer whether sheep should be classed as lambs or hoggets.

Thus if the opening stock for sheep is:

- Ewes (mixed age)
- Ewe hoggets
- Wether hoggets
- Rams

this classification should be maintained, even though there may be no wether hoggets on hand at the end of one year. In this way mistakes and confusion will be minimised. The actual classification to be used is decided on by the farmer, as he has to supply the accountant with the relevant information, but once organised it should be maintained. The accountant is mainly concerned with stock values and not numbers when drawing up a set of accounts; hence it is up to the farmer to ensure that stock numbers are correct.

The rule to use for checking stock numbers can best be put as follows: The number of stock on hand at the beginning of the year plus purchases plus natural increase must balance the number of stock on hand at the end of the year plus sales, losses, and killings for personal and other use. Modified versions can be applied to dairy and beef cattle as well as to any other stock which must be included in farm accounts.

Financial Implications of Livestock Account

For simplicity the figures for a dairy farm with no pigs will be used. Opening and closing livestock are usually valued at "standard values"; a standard value is defined as a "value selected by the farmer as closely approximating average market value of stock of a particular class". The use of standard values minimises fluctuations in taxable paper profits that would occur if the permanent flock or herd were valued at market values.

LIVESTOCK TRADING ACCOUNT

	Stock	Stock	£	£
Livestock 1 July 1959				
Mature cows, including heifers to calve down for first time, at £30	80		2,400	
Yearling heifers at £15	20		300	
Bull at £50	1		50	
Natural increase—Calves (mixed sex) ..	75			
Purchase—Bull at £100	1		100	
Sales—Calves at £2		55		110
Cull cows at £20		18		360
Losses—One heifer		1		
Livestock 30 June 1960				
Mature cows, including heifers to calve down for first time, at £30		81		2,430
Yearling heifers at £15		20		300
Bulls at £50		2		100
Surplus transferred to farm working account			450	
	177	177	3,300	3,300

Farm Working Surplus

The part that really interests us is the surplus which is transferred to the farm working account. How is this figure obtained and what does it mean? In this case it is arrived at by taking the value of livestock at the beginning of the year plus purchases and subtracting this from the value of stock at the end of the year plus sales. In sheep accounts it is usual to add a figure for value of livestock killed for home consumption to the later total. The mechanism of the livestock account as presented above may thus be simplified:

	£	£
Value of livestock 1 July 1959 ..	2,750	
80 cows		
20 yearling heifers		
1 bull		
Value of livestock 30 June 1960 ..		2,830
81 cows		
20 yearling heifers		
2 bulls		
Increase in value of livestock ..	+80	
	2,830	2,830

Receipts	£	**Expenditure**	£
Sales		**Purchases**	
Calves ..	110	Bull	100
Cull cows ..	360		
	470		100
Increase in value of livestock	+80	Surplus to farm working account ..	450
	550		550

This example demonstrates how the surplus is **calculated** in a livestock trading account, but the theory involved in obtaining this figure is more complicated and less well understood. From time to time some farmers wonder if perhaps an income item should be shown because of the increase in value of say heifers as they grow into mature cows. Because livestock are capital assets and because various classes are of different values, appreciation and depreciation do occur. Let us take another look at our example and follow just what has happened and how the surplus is really obtained (see table at top of next column).

	£	£
Increase in stock values		
At the beginning of the year 20 heifers were valued at £15 per head, and at the end of the year 19 of these had grown into cows valued at £30 per head. A total increase in value of		270
During the year 20 heifer calves were saved for replacements and at the end of the year they were valued at £15 per head. An increase in value of		300
Sale of calves realised		110
Decrease in stock values		
During the year 18 cows valued at £30 per head were sold at an average of £20 per head. A total loss of	180	
During the year a bull was purchased for £100 and at the end of the year was valued at £50. A loss of	50	
	230	
Surplus transferred to working account	450	
	680	680

Whether or not the surplus figure obtained is realistic depends on how close the "standard values" are to present "market values"; therefore the "standard values" chosen should be as realistic as possible.

Though more complicated because of the greater number of stock involved, the same process may be applied to sheep accounts. It is useful to have some idea of the theory of appreciation and depreciation of stock just outlined, but in practice the surplus is calculated automatically and more simply in livestock accounts by making use of opening and closing livestock values. In this way depreciation and appreciation of stock are accounted for.

Summary

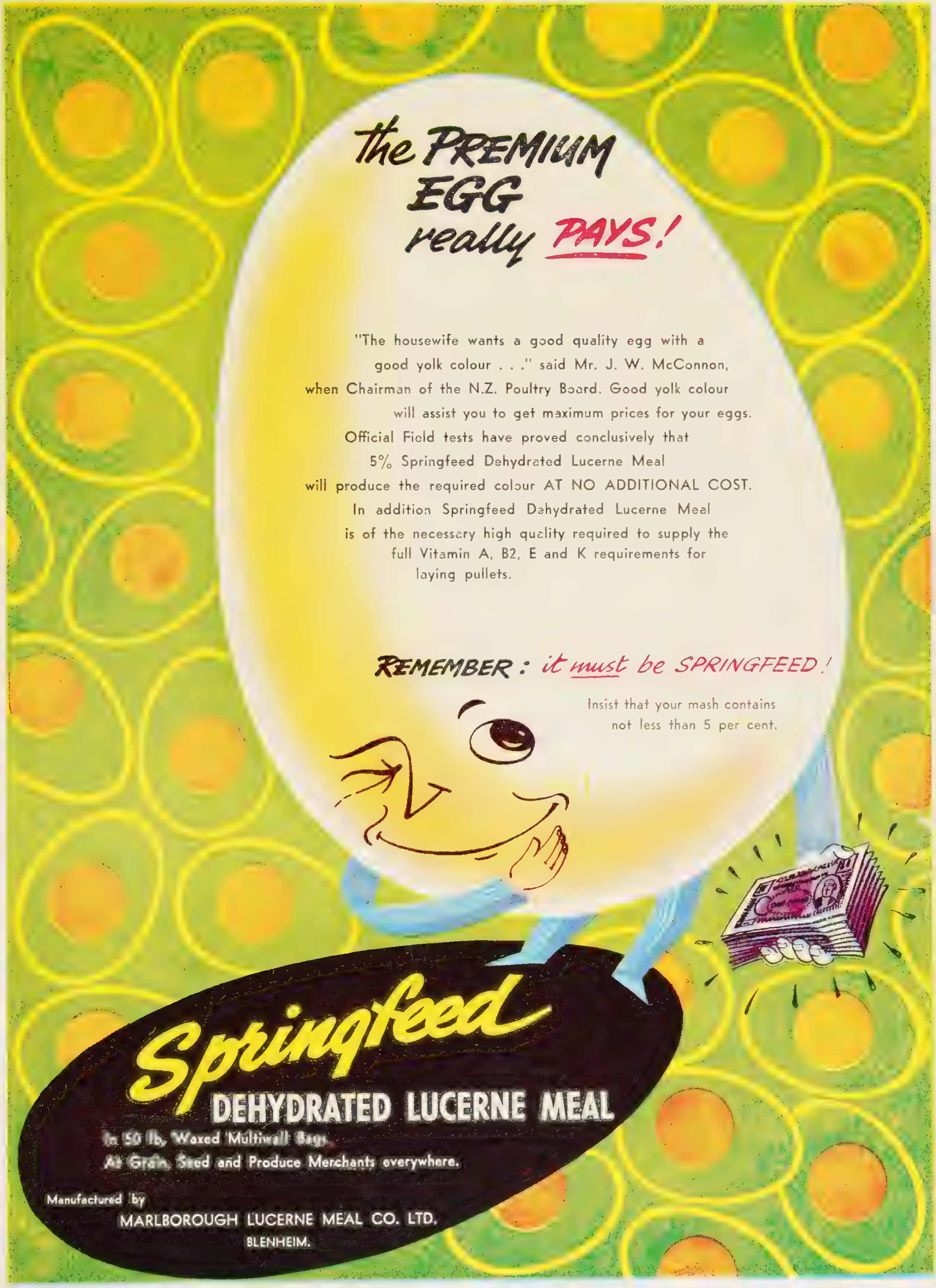
Care should be taken when supplying farm accountants with livestock details. Consistency must be maintained from year to year, numbers should be realistic and include losses, and figures must balance.

Stock should be broken up into classes depending on a farmer's requirements for simplicity and convenience.

Depreciation and appreciation of stock do occur, but are handled automatically in a livestock trading account.

At the present time a committee sponsored by the New Zealand Society of Accountants is working on a standard code for the presentation of farm accounts. This code will include a suggested break-up of livestock into various classes for the respective livestock accounts.

◆



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REMEMBER — SYNTHETIC FIBRES AREN'T BRANDED!

—J. E. Duncan

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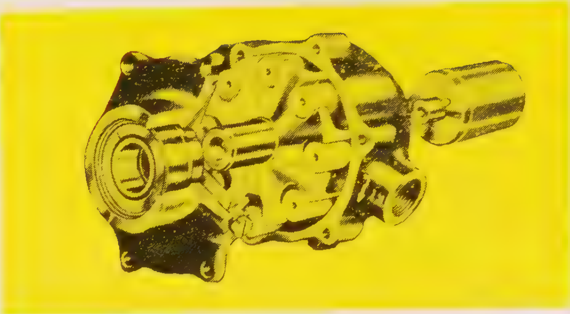

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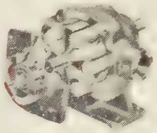

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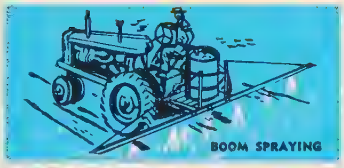

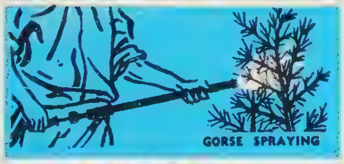

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Growing GOOD Fodder Beet

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By D. J. G. DAVIES,
Fields Instructor,
Department of Agriculture,
Christchurch

FOR the past 10 years fodder beet, mainly of Danish origin, has been grown in New Zealand. The popularity of this crop as a useful supplementary fodder among dairy and pig farmers is reflected in the increasing acreages grown, and the crop is largely replacing mangels in most districts. Fodder beet has many virtues as a highly nutritious, palatable winter fodder, not the least of which is its ability to produce high yields of roots with a relatively high percentage of dry matter. In this article culture of the crop is discussed, with notes on the varieties available. This information has been compiled from the results of a number of field trials on a wide range of soil types in recent years.

ALL the beet family, including the familiar garden beets, originated from the wild sea beet found in coastal regions of Europe. The modern fodder beet is a cross between the mangel (*Beta vulgaris*) and the sugar beet (*Beta vulgaris* var. *saccharifera*) and exhibits characteristics intermediate between those of its parents. It combines to some extent the high root yield of the mangel with the high percentage of dry matter of the sugar beet, and is superior to both in total yield of food units per acre.

Fodder beet has been grown in Europe for many years, but was not introduced into the United Kingdom until shortly after the Second World War, when there was a severe shortage of stock feed. In most countries where the crop has been grown, particularly in Denmark, it has largely replaced mangels.

Economic Importance

No other root crop is capable of producing such a high yield of dry matter—more than 6 tons per acre—for a relatively cheap outlay. It has proved an extremely reliable crop in this country, being able to withstand wet and dry conditions alike. This was amply demonstrated in the Canterbury drought seasons of 1956-57 and 1959-60. It is a consistently high yielder, largely because of its freedom from serious diseases. Fodder beet has a major advantage over mangels in that it can be fed directly to stock while, if necessary, surplus roots may be pit stored for several months after harvest.

Classification of Varieties

Varieties of fodder beet differ considerably in percentage of dry matter and ease of pulling.

On the Continent the term fodder beet is generally used to denote all types of *Beta* spp. used for stock food, ranging from mangels to sugar beet. The broad classification of the three groups set out in Table 1, page 335, is considered more suitable for New Zealand and is based on available dry matter and lifting characteristics.

Fodder beet can be pitted, but like mangels must be well covered with straw for protection against frost.

The proportion of root found above ground and the ease of lifting vary appreciably from crop to crop, but for varieties grown under the same conditions the order in which they are placed is always fairly constant.

(a) **Sugar beet:** Practically all of the root grows underground. Inclined to be fangy with a lot of soil adhering

FODDER BEET VARIETIES

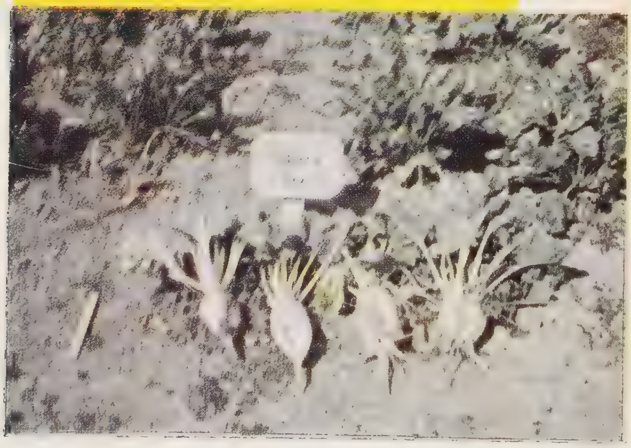
▲ Red Otofte, noted for its distinctive colour, is a useful cropper.

Yellow Daeno, a ▲ reliable cropper under most conditions

DRY MATTER 13-15%, ALL PURPOSE

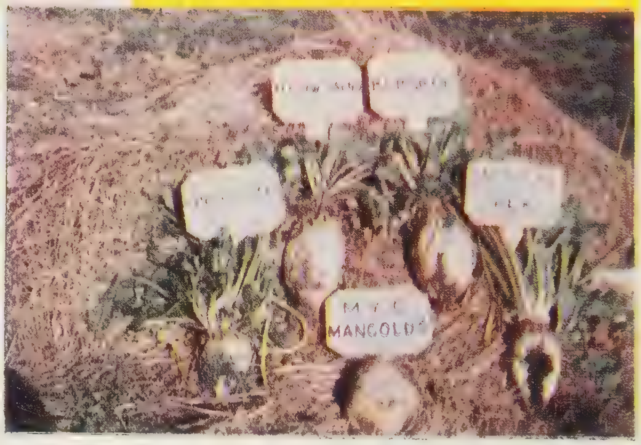
← Crop planted in 21 in. rows and interrow cultivated.

HIGH DRY MATTER, FOR PIGS



Pajbjerg Rex, the variety most suitable for pig feed.

COMPARISON WITH MANGEL



Varieties of fodder beet compared with mangel. Note dirt adherence on sugar beet types on extreme left and right; intermediate types in middle.

TABLE I—CLASSIFICATION OF FODDER BEET VARIETIES ACCORDING TO ROOT CHARACTERISTICS AND DRY MATTER CONTENT

Variety	Root characteristics			Per cent dry matter (in roots)	
	Ease of lifting	Proportion above ground	General shape	Average	Group range
		(A) Sugar beet types			
Klein-Wanzleben	Very hard	Practically none	Long tapering	23	20 to 25
Hinderupgaard	Fairly hard	Less than quarter	Long tapering	21	
Hunsballe	Hard	Less than third	Tapering	20	
		(B) Fodder beets			
Pajbjerg Rex	Fairly easy	About third	Tapering to long globe	19	13 to 19
Red Otofte	Easy	More than half	Tapering to long tankard	16	
Yellow Daeno	Easy	More than half	Tapering to tankard	15	
Korsroe	Easy	More than half	Tapering to tankard	14	
		(C) Mangels			
Yellow Globe	Very easy	Mostly above	Globe	10	8 to 12
Orange Globe	Very easy	Mostly above	Globe	9	
Long Red	Very easy	Mostly above	Tankard	9	

to root. Top growth large. Can be fed directly to stock.

(b) Fodder beet: Roots are generally easy to lift with a minimum amount of soil adherence. Top growth medium to large; of good quality. Dry matter content variable. Can be fed directly to stock.

(c) Mangels: Appreciably more than half root grows above ground; top growth insignificant. Roots very easily lifted and clean. Need to be kept for a while after pulling before they are fed to stock.

Varieties

Many varieties of fodder beet have been developed, but most of the types with which the New Zealand farmer is familiar are of Danish origin. Some of these have been widely tested in trials throughout the Dominion, and the following are available commercially:

Korsroe: Medium to long well filled roots with pale yellowish flesh. Greenish yellow skin above ground and orange to reddish below. Free from fangs and very easily lifted; roots growing more than half above ground; clean and uniform in shape. Top growth medium to large. Average yield 45 tons of roots, 15 tons of tops; average dry matter 14 per cent. A most useful all-round variety for feeding to all classes of stock and growing over a wide range of soil and climatic conditions.

Yellow Daeno: Of medium length, oval; well filled root with yellowish skin and pale yellow flesh. Free from fangs and very easily lifted. Roots clean and uniformly shaped, more than half growing above ground. Top growth medium. Average yield 40 tons of roots, 10 tons of tops; average dry matter 15 per cent. A good all-round, consistent cropper on most soils.

Red Otofte: Notable for its distinctive red colour, medium to long, well filled, uniform shape with deep red roots and leaf stalks. Flesh white with reddish flecks. Free from fangs and very easily lifted; low dirt adherence, roots clean, more than half above ground. Medium top growth. Average yield 35 tons of roots, 10 tons of tops; average dry matter 16 per cent. A good all-round variety for most fertile soils.

Pajbjerg Rex: A medium to long, pear shaped, white-fleshed root somewhat variable in length with a green skin above ground and white below. Fairly easily lifted in all but the heaviest soils. Rather prone to fanging with a fairly high dirt adherence—third of root above ground. Tops medium to large. Average yield 30 tons of roots, 10 tons of tops. Average dry matter 19 per cent. A useful variety for feeding to pigs.

Other varieties under trial were:

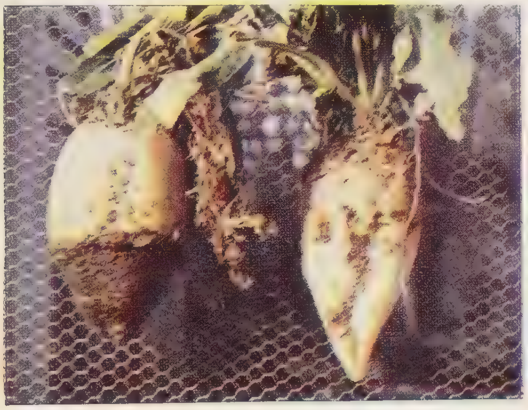
Hunsballe: A medium to long, tapered, pear shaped, white-fleshed root of uniform shape. Fairly difficult to lift, with a tendency toward fanginess. High dirt adherence. About fifth of root above ground. Tops large. Average yield 25 tons of roots, 15 tons of tops. Average dry matter 20 per cent. Suitable for deep, fertile, sandy loams only.

Hinderupgaard: Long, tapered, white-fleshed root of uniform shape, but inclined to fanginess. Very difficult to lift and has a high dirt adherence; about seventh of root above ground. Yield of tops often equals yield of roots. Average yield per acre 20 tons of roots, 20 tons of tops. Average dry matter 20½ per cent. Suitable for deep, fertile sandy loams only.

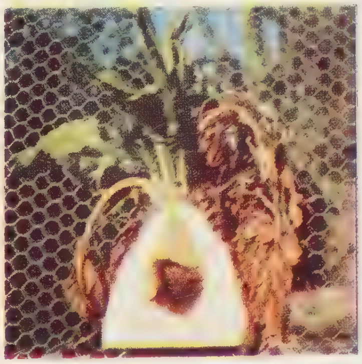
Trials here and overseas show that the dry matter content of fodder beet is closely related to ease of lifting. Varieties with the highest dry matter content are very difficult to lift and those with low dry matter content easy. Types intermediate between these two extremes should be chosen.

(Continued on page 337)

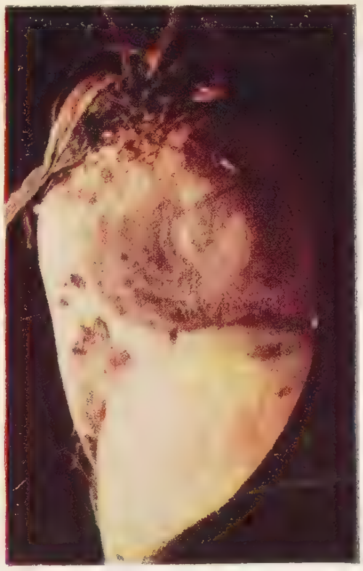
DISEASES OF FODDER BEET (See text page 341)



Violet root rot (left), caused by the soil fungus *Helicobasidium purpureum*; healthy bulb at right.



Hollow heart caused by boron deficiency.



Dry rot caused by *Phoma betae* (recorded in Balclutha area in 1957).

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Food Value

Feeding trials in several countries over a number of years have shown that, for all practical purposes, the food value of the roots and tops can be estimated from the quantity of dry matter present, the chief substance in the roots being sugar (up to two-thirds) and in the tops, protein (up to 20 per cent).

Soils and Climate

Fodder beet, like the mangel, does best in warm, moist climates where it can be sown early and can continue growing until well into autumn. Consistently cool temperatures and high rainfall toward the end of the growing season will result in low dry matter percentages, while low rainfall at the same period will produce high dry matter contents.

Most of the fertile soils throughout both islands are suited to the growing of this crop. Deep, fertile, free working, well drained loams are best, but trials have shown that the crop will grow satisfactorily under a wide range of soil conditions if enough fertiliser is used.

Place in Rotation

Fodder beet should generally be grown on well drained parts of the farm to ensure easy handling and good access during harvest or feeding off. Because small acreages of the crop are usually grown it is a useful means of renewal of pastures on high fertility winter-feeding, night, or pig paddocks. It is an ideal cleaning crop, allowing maximum weathering and sweetening of the soil after a winter fallow, when a complete breakdown of organic matter will have been effected.

Fodder beet usually follows grass in the rotation and is a good preparation crop for peas, barley, or summer green feed, or simply as an in-between crop before sowing new pasture. A second crop of fodder beet grown on the same land will often outyield the first, but may entail risk of disease.

Seedbed Preparation

A seedbed similar to that for mangels is required. Cultivation should be deep and thorough and should begin early enough to allow decomposition of turf and trash. Subsequent cultivation will be mainly directed at germination and destruction of weed seedlings and the preparation of a firm, fine, moist seedbed.

Well drained paddocks with friable and easily cultivated soil are best for fodder beet, and if they have been stocked heavily during autumn and winter so much the better. In the South Island ploughing should begin in mid May or June and be followed by a fallow until August, when the area can be surface worked with grubber and discs. Several discings, harrowings, and rollings will be necessary to prepare the seedbed.

Cultivation in the North Island normally begins in August or later on the lighter, free-working soils, but generally the earlier cultivation begins the better the crop will be.

Sowing

From mid September until November is the best time to sow, as the crop takes from seven to eight months to mature. Seeding rates vary from as low as 2 lb per acre, if segmented or rubbed seed is used, to 4 lb per acre for untreated seed.

In recent years the use of high-germinating segmented seed has become common to facilitate the production of single seedlings and thereby considerably reduce the labour required.

The seed and fertiliser are usually banded together either in drills sown to a uniform depth of ¾ in. on the flat or in ridges at 21 in. or 28 in. intervals. It is often advisable to roll ridges immediately after sowing, particularly if the seedbed is dry, to bring moisture to the surface and encourage early and even germination of seeds.

A small wheeled cultivator is sometimes used for sowing small areas after the fertiliser has been applied to a depth of 2½ to 3 in. through a drill. Prior treatment of the seed with a fungicide will give protection against seedborne disease.

Fertiliser Requirements

Fodder beet is a gross feeder and a minimum application of 3 to 4 cwt per acre of a mixed fertiliser consisting of 3 parts of superphosphate and 2 parts of blood and bone, sown before or, preferably, with the seed, is recommended.

Good results have been obtained by the inclusion of up to 2 cwt of agricultural salt per acre. Chilean nitrate could be used instead, because it supplies both nitrogen and sodium. Salt (sodium chloride) has a suppressing effect on weed seedlings and is necessary for complete development of the beet.

Farmyard manure and well rotted stack bottom can also be applied to advantage before ploughing.

Applications of up to 2 cwt per acre of a nitrogenous fertiliser may increase yield of roots and will certainly promote growth of large, succulent leaves, particularly where irrigation is possible during dry weather.

Lime should be applied only to areas that have not received a dressing for some time. If paddocks are overlimed, a deficiency of the trace element boron may occur, resulting in the familiar "heart rot" conditions. This deficiency disease, which affects all root crops, can be prevented by applying 15 lb of borax per acre or by the use of borated superphosphate at sowing. On no account mix seed with boron or boron-treated fertiliser, because if this is done, germination will be impaired. If a deficiency of boron is suspected, the local Farm Advisory Officer should be consulted. In general, local district fertiliser practice should be followed with fodder beet.

Thinning

Trials overseas have established that maximum root yields are closely correlated with density of plantings, which should approximate 30,000 plants per acre. A row spacing of 21 in. with plants singled to 10 in. apart is as close as is practicable to this figure. Where larger root development is desired and a longer period of intercultivation to combat weeds is necessary, sowing in 28 in. rows and thinning to 9 in. to 14 in. between plants is recommended.

Thinning should begin as soon as plants are large enough to separate easily—usually about four or five weeks after sowing—while plants are still in the two- to three-leaf stage and when the ground is still moist. Plants should be thinned to 9 in. to 10 in. for small-topped varieties and up to 12 in. to 14 in. for the larger leaf producing types.

All weeds close to the plants should be destroyed. When a hoe is used for thinning particular care must be taken to avoid leaving any unnecessarily large gaps, which will reduce the yield. The advent of mechanical thinners and the use of segmented seed should reduce the high labour demand for this phase of crop culture. Many farmers who have used segmented or rubbed seed confirm a saving in thinning time by as much as one-third.

Intercultivation

The importance of inter-row cultivation for weed control, moisture conservation, and root development cannot be too strongly emphasised. Cultivations should begin as soon as plants are distinguishable in the rows.

It is advisable to begin the first mechanical inter-row cultivation with a series of narrow tines spaced on the tool bar to ensure deep cultivation close to the plants without undue risk of injury. When tines are being set due allowance should be made for wheel wander.

The second cultivation is usually done shortly after thinning. If weeds are prevalent, the half duck-foot type of weed cutting attachment should be used. The sharp L-shaped knife edge will control weeds while the soil is still loose and friable. Subsequent and final inter-row cultivations can be done with the wider, grubber type tine until it is difficult to negotiate the rows. The strong leaf growth of fodder beet will smother later weed growth. On very small areas the

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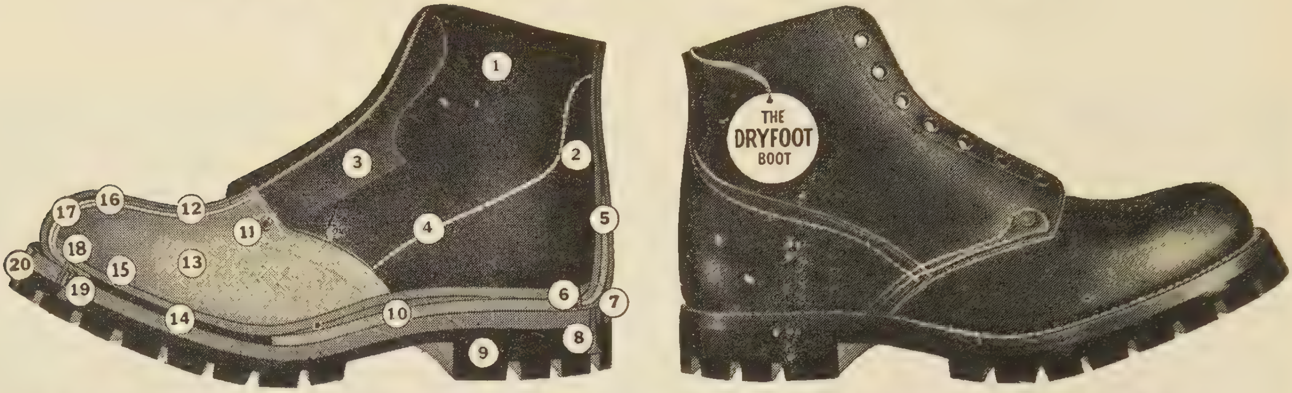

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WELLINGTON (Head Office) AUCKLAND CHRISTCHURCH DUNEDIN rotary hoe with a 15 in. to 20 in. cut is a convenient implement for intercultivation.

No really satisfactory chemical control of weeds in fodder beet is known.

Transplanting

Transplanting is a popular method of establishment on small areas in districts where summer rainfall is high and where annual weeds are troublesome. It is most suitable for the North Island, where transplanting is normally done from December onward. Transplanting has been successful in the North Island and in the northern half of the South Island where artificial means of watering have been available.

Transplanting has many obvious advantages over sowing and thinning in addition to allowing for better weed control through more complete cultivation. Some very high yields have been obtained with this method, because more accurate plant spacing allows greater and more uniform root development. The use of mechanical precision planters similar to those used by market gardeners may ultimately revolutionise the ease and speed of this operation. Seed should be sown during September in nursery beds in warm, sheltered situations.

The young (eight-weeks-old) plants are pressed into the side of a freshly turned soft furrow slice and covered on the next round of the plough. Plants should be spaced about 12 in. in rows with rows 20 in. apart. Transplanting is not recommended where rainfall is low and unreliable, unless portable irrigation spraylines are available. This equipment can be used to good effect throughout transplanting and whenever dry spells occur.

Harvesting and Storage

Crops sown in October to November mature in up to eight months (May onward). The mature crop can be fed immediately it is lifted whereas the mangel needs a long maturing period in covered clamps.

The succulent top growth of fodder beet is high quality green feed and should be used if practicable before severe winter frosts begin. Tops die back rapidly with continued frosting and much good feed will be wasted unless tops are fed during April and May by break feeding in situ for short periods with cattle or sheep. With cattle each grazing should not exceed half an hour and should be carried out in the afternoon to minimise risk of overfeeding.

The tops, particularly of the deep rooting, sugar beet types which yield 15 to 20 tons per acre of green material, which is easily mown and carted with a buckrake, are commonly ensiled overseas. Tops regrow rapidly after mowing or grazing, with very little reduction in food value.

Most dairy farmers prefer to pull a tractor load of beet in the late afternoon, allow it to wilt overnight, and feed it out with hay or silage after the morning milking.

Surplus beet can be lifted and stored in the same way as mangels. Tops should be removed by wrenching. Roots for storage should be sound and free from bruises or damage.

Overseas experience suggests that the higher dry matter varieties store more successfully and longer than those with low dry matter content. Storage sites should be sheltered and well drained and the heaps or clamps liberally covered with straw as a protection against frost damage.

Feeding and Digestive Upsets

Most farm livestock, including horses and poultry, relish fodder beet once they have acquired a taste for it. In New Zealand dairy cattle, pigs, and, to a less extent, sheep, are fed on it during winter.

As a safeguard against digestive upsets or poisoning, animals unaccustomed to fodder beet should be given only a little at first and should be fed some good hay immediately beforehand. Overfeeding of beet on an empty stomach has caused some deaths of stock.

Beet should be fed to housed pigs in wooden containers to prevent contamination of the feed. It may be necessary to quarter the roots fed to young pigs and to dairy cows new to this type of feed to avoid their choking. To cattle and pigs in the open the daily ration of roots is best fed on clean grass paddocks free from pugging. Because fodder beet is not a completely balanced foodstuff, it should always be fed with good hay, silage, winter-saved pasture, or cereal green feed.

The crop can be fed off in situ by both pigs and sheep. A mixture of swedes, chou moellier, and fodder beet is favoured as a winter feed for ewes by some Canterbury farmers as an alternative to turnips, which are an unreliable crop because of turnip mosaic. Two acres of the mixed crop will feed about 2,000 ewes for a week.

The following table indicates the amount of fodder beet of varieties such as Korsroe, Yellow Daeno, and Red Otofte which can be safely fed to adult cattle, sheep, and pigs.

The maximum ration must not be fed immediately to stock, but should be reached only after two to three weeks' feeding. Commencing rates of feeding should not exceed 10 lb a day for cattle and 5 lb for sheep.

The quantity of roots fed should be fairly accurately assessed. A simple method is to pull and weigh a few beets and if the number of roots is counted, an estimate can be made of the number of roots required for a day's feeding. The amount fed to sheep can be controlled by break feeding for a short period each day in the initial stages. Particular care should be taken in feeding to stock the varieties with high dry matter content.

Summary

Salient points from an extensive programme of feeding and variety trials and farm surveys on fodder beet since its introduction to New Zealand agriculture nearly 10 years ago are:

1 Fodder beet yields nearly as high as mangels and produces twice the amount of dry matter per ton. It is a consistently reliable yielder under variable weather and soil conditions, but requires high fertility.

2 The crop is extremely palatable because of its high sugar content. It can be lifted and fed direct to stock.

3 Direct seedings may be made from mid September to early November at 2 lb per acre for segmented seed and 4 lb for untreated seed. Transplants may be put out in December.

4 Fodder beet responds well to generous manuring and adequate cultivation. It is better to grow 1 acre well than 4 acres poorly.

5 Recommended varieties are Korsroe, Yellow Daeno, Red Otofte and Pajbjerg Rex, the last being particularly suitable for pigs.

6 Freedom from serious diseases makes fodder beet a reliable crop.

7 A recent survey indicates that the acreage of fodder beet is increasing in most districts, but further field work is required to assess the place of mechanisation in the handling of the crop on limited acreages.

TABLE 2—DAILY RATION AND TOTAL WINTER REQUIREMENTS

	Ration per animal			
	Per day lb	Per 100 days	*Area required acres	No. of stock
Friesian cow	60-65	2.7 tons	3½	50
Jersey cow	40-45	1.9 tons	2½	50
Romney ewe	6-10	7.1 cwt	1	100
Breeding sow	25-30	1.2 tons	¼	10

* Based on an estimated yield of 40 tons of roots per acre with a dry matter content of 15 per cent.

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Diseases of Fodder Beet and Mangels

By H. C. SMITH,

Plant Diseases Division, Department of Scientific and Industrial Research, Lincoln

Fungous Diseases

Seedling Diseases

The most common cause of a poor strike and damping off of seedlings is attack by soil fungi such as *Pythium* spp. and *Phoma betae*, which is seedborne. These fungi are best controlled by treatment of seed with dusts containing thiram, captan, or organic mercury compounds. Dusting of the seed with these chemicals is a good insurance against a poor seedbed or adverse weather after sowing, because the soil fungi are usually most active when conditions for germination are adverse.

Leaf Diseases

Rust: At present there are no serious leaf diseases of beet in New Zealand. Rust caused by the airborne fungus *Uromyces betae* is common throughout New Zealand, but seldom becomes severe enough to cause much loss in yield. The disease appears as small orange pustules on the surface of the leaves.

Leaf spot (*Cereospora beticola*) has been recorded as being severe in some North Island districts during wet seasons. The condition causes destruction of foliage from autumn onward. No control measure is necessary.

Root Diseases

Violet root rot, caused by the soil fungus *Helicobasidium purpureum*, occurs in several areas in the South Island. It is generally associated with alkaline soils high in organic matter and consequently does not appear likely to become a serious disease in New Zealand. Violet root rot may be readily recognised by the violet margin of the fungus infection as it grows over the surface of the roots. Rotting of the bulbs occurs a short distance behind the margin of the infection, but the infection does not spread very rapidly and serious losses are not common.

Dry rot caused by *Pleospora* (*Phoma*) *betae* is often seedborne and can cause seedling disease. However, the main infection occurs at the leaf bases and on the tops of bulbs, where it causes a spreading, deep, dry rotting of the flesh. The disease can also infect crops by airborne spores from the residue of previous crops, so it is important to feed off old crops completely or plough them under before spring. Dry rot infection in seed can be reduced by seed treatment as advised under seedling diseases.

Sclerotium root rot, caused by the soil fungus *Sclerotium rolfsii*, has appeared in isolated areas of the North Island. Some host plants are the common flowers dianthus, carnation, and delphinium. Where infection has been observed, destruction of residues and crop rotation are most important.

Virus Diseases

Beet mosaic has been found in many areas in New Zealand, but is not a serious disease and is unlikely to become important even if a large area of the crop is grown.

Yellows, on the other hand, is not yet present in New Zealand, but could become a serious threat to crops if it reaches this country. If bright yellow and stunted plants are found, the Department of Agriculture should be advised so that a check for the disease can be made, because the aphids which can spread this virus are already in New Zealand.

Deficiency Disease

Boron deficiency is probably the most common and most serious deficiency disease in fodder beet in New Zealand. It is prevalent in Canterbury and Otago and can cause losses of up to half of the crop. Roots rot when the mottled heart and spongy breakdown of the crown tissues become invaded with soft rot bacteria (*Bacterium carotovorum*).

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"Fodder Beet for Feeding Pigs", I. H. Owtram, "The New Zealand Journal of Agriculture", March 1953, p. 219, May 1953, p. 427.

"Beets Are a Valuable Source of Fodder for Stock", J. H. Claridge, "The New Zealand Journal of Agriculture", September 1955, p. 272.

"Mangolds", J. E. Davies, "The New Zealand Journal of Agriculture", October 1947, p. 355.

Former Farm Manager at Ruakura Dies

MR A. W. GREEN, who died recently in Hamilton, was a former farm manager of Ruakura Experimental Farm (now Ruakura Animal Research Station) and a member of the staff during the first stages of development. As nurseryman on the farm in the early 1900s Mr Green was in charge of the planting of shelter belts and shade trees, many of which remain as a feature today.

When experimental work was begun by the Department of Agriculture on the property at Ruakura oats were an important crop in the Waikato, but were widely affected by rust disease. Attempts were therefore made at Ruakura to breed a resistant variety and this was completed in 1908 by Mr Green, who at this time was horticulturist and plant breeder.

The variety, known first as Ruakura Rust-resistant and later as Green's Ruakura Oat, went out of use with the general decline in oat growing in the Waikato. Much of the research and experimental work on crops and pastures at Ruakura during Mr Green's service was reported by him in articles in early issues of the "Journal". His most outstanding experimental work was the initiation of the use of *Lotus uliginosus* (*major*) and Yorkshire fog in the primary grassing of raw peat swamps.

Mr Green was farm manager at Ruakura Experimental Farm from 1917 to 1925, when he left the Department. Subsequently he was for many years secretary of the New Zealand Milking Shorthorn Association and of the Auckland branch of the New Zealand Pig Breeders' Association.

Winter Show Dates

9, 10, 11, 12, and 13 May—Southland at Invercargill.

*1, 2, 3, 5, and 6 June—Otago at Dunedin.

*30, 31 May, 1, 2, 3, 5, and 6 June—Waikato at Hamilton.

8, 9, and 10 June—Te Kuiti and District at Te Kuiti.

*14, 15, 16, and 17 June—Taranaki at New Plymouth.

20, 21, 22, 23, 24 June—Whangarei at Whangarei.

* The Department of Agriculture exhibit will be staged at this show.

Breeding Stock Sale

27 July—National Stud Hereford Show and sale at Palmerston North.

Wool Sales

The dates and venues of wool sales up to the end of June are:

19 and 21 April: Christchurch.
26 and 28 April: Invercargill.
3 May: Dunedin.
20 May: Wanganui.
24 and 26 May: Napier.
31 May and 2 June: Auckland.
7 June: Wellington.

Radio Broadcasts for Farmers

RADIO broadcasts for farmers will be given during May as follows:

1XH Hamilton, 12.33 p.m.

8 May—"Progress in Peat Research", by F. van der Elst, Scientific Officer, Department of Agriculture's Rukuhia Soil Research Station.

15 May—"Grass Grub Control", by M. G. Boyer, Farm Advisory Officer, Department of Agriculture, Hamilton.

22 May—"Tile Drainage", by D. F. Scott, Instructor in Agriculture, Department of Agriculture, Hamilton.

29 May—"Care of Bobby Calves", by G. R. Mackintosh, Livestock Instructor, Department of Agriculture, Hamilton.

1YZ Rotorua, 7.15 p.m.

10 May—"'Young Farmers' Clubs", by Western Bay of Plenty Y.F.C. district committee.

24 May—"For and Against Cropping", by R. W. Moody, Farm Advisory Officer, Department of Agriculture, Rotorua.

2XA Wanganui, 8 p.m.

4 May—"For the Country Women", by Mary Macdonald.

11 May—"Farming News".

18 May—"How 4,000 Pigs are Kept on 4 Acres", by E. M. Bailey, Supervisor, Taranaki District Pig Council.

25 May—"Poultry Notes", by B. J. Russell, Poultry Instructor, Department of Agriculture, Wanganui.

2XB Masterton, 6.45 p.m.

12 May—"Soil Conservation", by M. King, Chief Soil Conservator, Wairarapa Catchment Board.

2XG Gisborne, 8 p.m.

2 May—"Practical Hints for Poultry Keepers", by H. K. Mullins, Poultry Instructor, Department of Agriculture, Hastings.

9 May—"For the Orchardist", by J. Overbye, Horticultural Instructor, Department of Agriculture, Gisborne.

16 May—"Maize Harvesting and Drying", by H. de O. Chamberlain, Farm Advisory Officer, Department of Agriculture, Gisborne, and R. Mullooly.

23 May—"Sheep and Wool Activities", by R. W. Scaife, Sheep and Wool Instructor, Department of Agriculture, Gisborne.

30 May—Session conducted by the Gisborne Veterinary Club.

2XP New Plymouth, 8 p.m.

4 May—"News and Views from the Farm Advisory Division", by S. H. Henry, Farm Advisory Officer, Department of Agriculture, Stratford. "Y.F.C. Session", by David Smith

18 May—"Farm Dairy Hygiene", by G. R Insull, Farm Dairy Instructor, Department of Agriculture, New Plymouth

25 May—"Radio Vet.", by J H. Macdonald Veterinarian, Department of Agriculture, New Plymouth.

2YZ Napier, 7.10 p.m.

2 May—"Spring Sowings of Brassica Crops", by F. H. Collin, Instructor in Agriculture, Department of Agriculture, Hastings

16 May—"Care of Ewes before Lambing", by T. H. Dysart, Veterinarian, Department of Agriculture, Hastings.

30 May—"Soil Conservation", by S. T. Anaru, Farm Advisory Officer (Soil Conservation), Department of Agriculture, Hastings

3YA Christchurch, 12.20 p.m

1 May—"Vegetable Growing during Winter and Early Spring", by W. Brandenburg, Horticultural Instructor, Department of Agriculture, Christchurch.

4YA Dunedin and 4YZ Invercargill, 12.36 p.m.

1 May—"Control of Sweet Brier", by A. A. Duncan, Farm Advisory Officer, Department of Agriculture, Alexandra

8 May—"Flock Management", by A. W. J Apps, Livestock Instructor, Department of Agriculture, Palmerston.

15 May—"Farm Management in Southland", by M. J. Fitzharris, Farm Advisory Officer, Department of Agriculture, Gore.

22 May—"Winter Feeding of Stock", by K. G. Gray, Livestock Instructor, Department of Agriculture, Invercargill

29 May—"New Chemicals in Horticulture", by I. G. Forbes, Assistant Horticultural Superintendent, Department of Agriculture, Dunedin.

Fruit Crop Estimates for 1960-61 Season

THE following estimates made in February of the fruit crop for the 1960-61 season are in 000's of bushel cases. They are summarised from information supplied by field officers of the Horticulture Division of the Department of Agriculture. Districts producing less than 500 bushels of a variety are not shown, but are included in totals. District totals of more than 500 are rounded to the nearest 1,000. The berry fruit estimates are in tons.

FRUIT	DISTRICT								
	Auckland Province Except Gisborne	Gisborne	Hawke's Bay	Wellington and Taranaki Provinces	Nelson Province	Marlborough	Canterbury and North Otago	Central Otago	Total 000 bushels
APPLES—		000's of bushel cases							
Ballarat	75	4	80	3	6	9	11	2	190
Cox's Orange Pippin	10	1	78	3	150	13	18	16	289
Delicious	18	8	100	4	270	35	27	64	526
Dougherty	15	4	75	—	38	2	—	—	134
Granny Smith	164	8	232	8	135	5	3	7	562
Gravenstein	21	—	28	—	105	2	2	3	161
Golden Delicious	24	1	61	1	114	7	12	9	229
Jonathan	12	—	52	3	341	40	21	36	505
Sturmer Pippin	9	6	255	20	474	40	74	47	925
Others	88	7	165	10	117	16	51	44	498
Total	436	39	1,126	52	1,750	169	219	228	4,019
PEARS—									
Beurre Bosc	4	—	5	—	12	—	1	—	22
Louise Bonne Jersey	1	—	30	—	1	—	—	1	33
Packham's Triumph	17	—	15	—	18	—	—	—	50
P. Barry	9	1	23	—	7	—	2	—	42
W. B. Chretien	28	1	122	1	95	1	7	23	278
Winter Cole	1	1	105	1	68	2	9	10	197
Winter Nelis	—	1	70	1	12	1	2	18	105
Others	27	—	11	1	17	1	9	6	72
Total	87	4	381	4	230	5	30	58	799
Quinces	11	—	7	—	1	—	1	—	20
STONE FRUITS—									
Apricots	1	1	7	—	—	—	15	172	196
Cherries	—	—	1	—	—	3	1	13	18
Nectarines	2	1	17	—	1	—	2	31	54
Peaches	77	12	412	2	48	7	8	115	681
Plums, European	1	—	7	—	2	—	2	19	31
Plums, Japanese	38	2	76	1	6	1	9	12	145
Totals	119	16	520	3	57	11	37	362	1,125
BERRY FRUITS—			Total in tons						
Boysenberries	4	2	9	5	19	—	4	7	50
Currants, Black	—	—	—	24	5½	—	54	—	83½
Gooseberries	—	—	1	125	3	—	8	—	137
Loganberries	1	2	1	10	5	—	18	—	37
Raspberries	5	2	70	125	293	3	415	52	965
Strawberries	445	20	60	175	11½	2	164	120	997½
Total	455	26	141	464	337	5	663	179	2,270
Walnuts	—	8	45	2	2	40	50	5	152

Bounty Payment for Opossum Tokens

WITH the undertaking by Rabbit Boards of opossum destruction work from the beginning of this month the opossum bounty and skin subsidy scheme has ceased to operate.

As tokens taken late last month could not be submitted in time to qualify for bounty payment before the termination of the scheme, arrangements have been made for the Opossum Bounty Office, New Zealand Forest Service, Wellington, to accept tokens for payment until 28 April. Tokens received after that date will not be paid for.

Whey as a Feed for Pigs

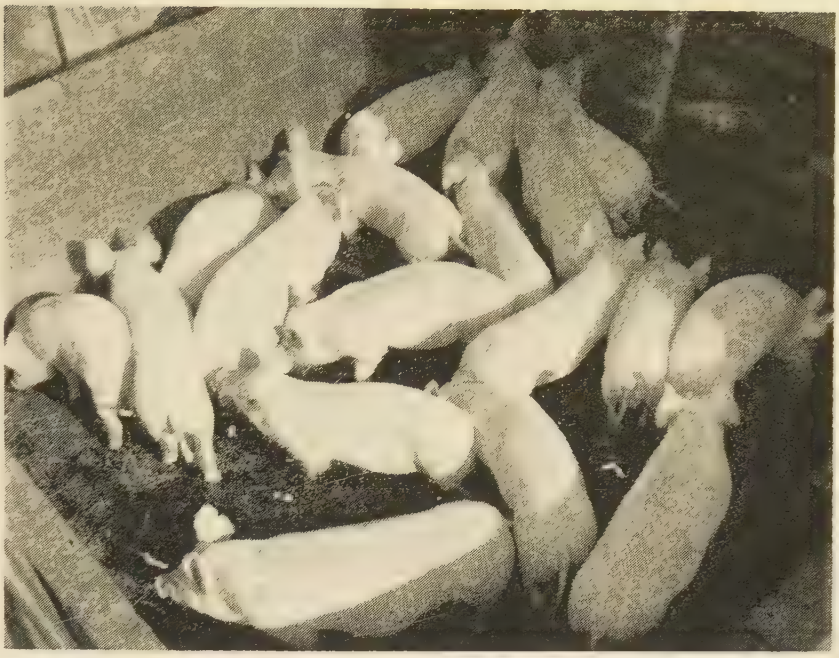
By I. H. OWTRAM,
Extension Officer in
Pig Husbandry,
Department of Agriculture,
Wellington

WHEY may become more important as a feed for pigs than it has been in the past, because the quantity of skim milk available as pig food is decreasing with the increase in the manufacture of dried milk products and the whey disposal problem is becoming more acute owing to legislation regarding the pollution of streams, rivers, and beaches. This article sets out the principles of pig production using whey as a basic food.

WHEY has been used as a food for pigs from the early days of farming in New Zealand. On the establishment of one of the first cheese factories in the country at Edendale, Berkshire pigs were imported and fed on the whey. From that date whey has been used as a feed for pigs, though with the development of the dairy industry the quantity available expanded beyond the capacity of pig producers to deal with it efficiently.

In the past much whey has been wasted and a very large quantity still is. Today this is no doubt due to the easing of economic pressure on dairy farmers, the fluctuating nature of the supply making it somewhat difficult to handle, and the supplier to a cheese factory not having to take whey back from the factory if he does not wish to. Suppliers to cheese or casein factories used to deliver whole milk to the factory daily and take whey home on the return trip, but with the increasing use of tanker collection of whole milk from the cow shed there is no return delivery of whey to the farm and farmers wishing to use whey for pig feeding have to make their own arrangements for cartage.

Whey resulting from the manufacture of cheese and casein remains the property of the supplier and the dairy company has no rights over it. This has prevented the establishment of



| *Paul*

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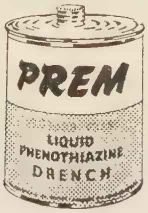

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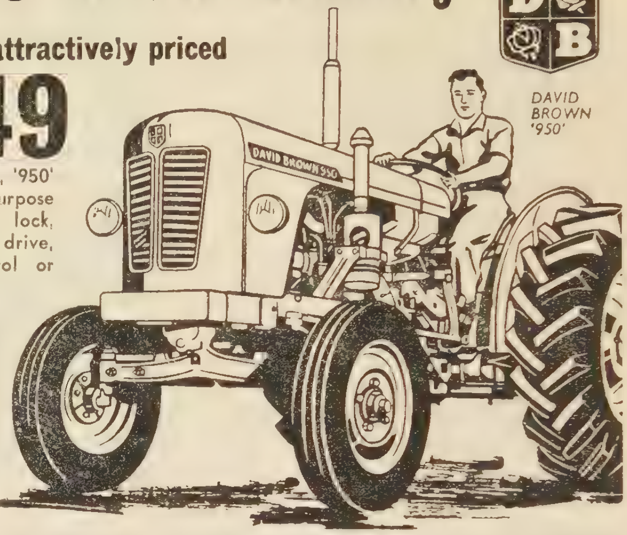

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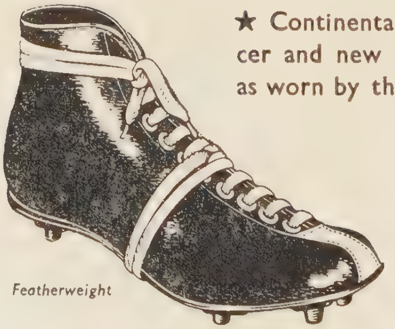

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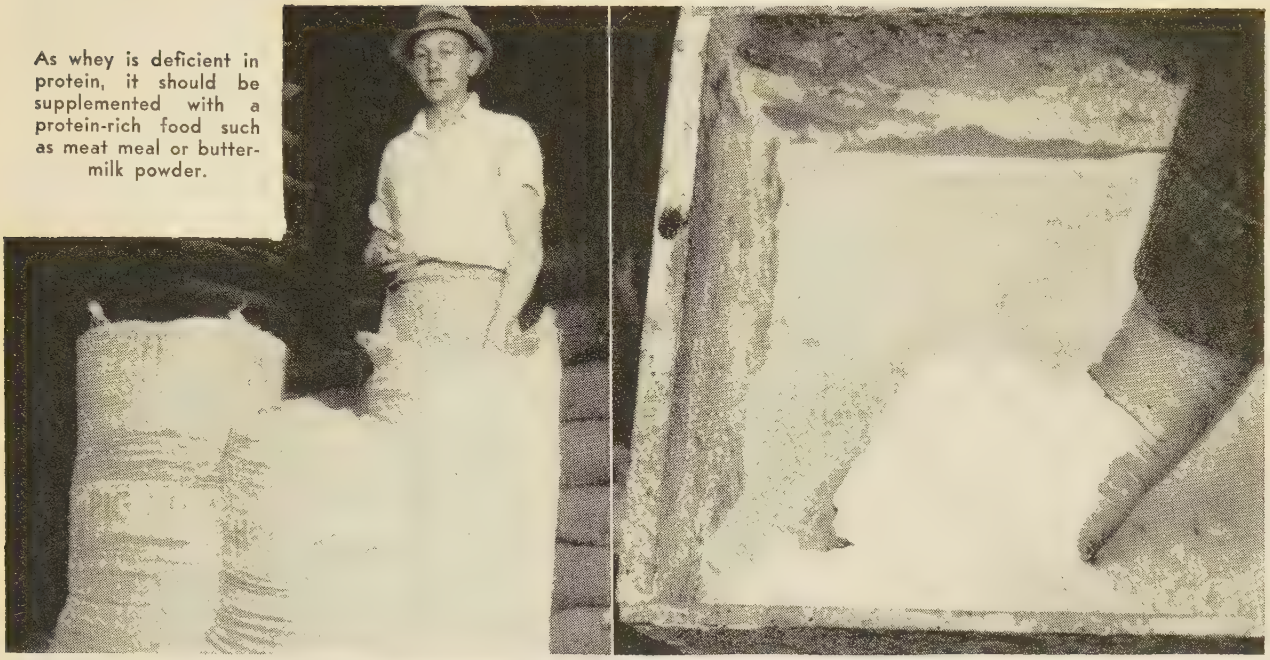

As whey is deficient in protein, it should be supplemented with a protein-rich food such as meat meal or butter-milk powder.

large-scale pig farms adjacent to dairy factories in the past, though today one or two companies have succeeded in establishing pig farms by agreement with their suppliers, and this move may spread. Private individuals have also been successful in some cases in negotiating with their fellow suppliers for a supply of whey and have been able to develop an efficient and economic pig unit.

Value of Whey as Pig Feed

Whey produced in either cheese or casein manufacture is a valuable food for pigs, but its food value is not as high as that of skim milk, 1½ gallons being the equivalent to 1 gallon of skim milk. Each ton of cheese manufactured and each ¼ ton of dried casein yields 1,620 gallons of whey. At 1½ gallons to each food unit this equals 1,080 food units. If it is assumed that as much as 8 food units are required to produce 1 lb of pig meat, the value of the whey from 1 ton of cheese or a ¼ ton of dried casein would be equal to the value of 135 lb of pig meat or one baconer pig.

Whey, like skim milk, is not a complete food for pigs, particularly during the first four months of their lives. It has the disadvantage of being even more bulky than skim milk, and for satisfactory pig production it must be supplemented with a concentrated food (of small bulk but high food value) in the form of a meal mixture. As whey is a carbohydrate food, the supplementary food used must contain adequate protein, particularly for young pigs.

The supply of whey for pig feeding is seasonal because of the organisation of dairy manufacture in New Zealand. The seasonal variation tends to be even more clearly defined than that of skim milk, as cheese and casein factories generally cease manufacture altogether for at least two months during winter, and suppliers endeavour to have all their cows dry during this period and to bring them in as rapidly as possible after the factory re-opens, which is generally at the beginning of August.

Though cheese whey is slightly higher in food value for pigs than casein whey, they can be taken as of equal value, because casein whey can be fed warm and does not readily increase in acidity with loss of sugar, as does cheese whey. However, casein whey produced by the sulphuric acid method of casein manufacture is not suitable for feeding to pigs. Casein whey produced by the lactic acid method of manufacture, which is more usually employed, is an entirely satisfactory feed for pigs.

Whey contains about 6.2 per cent of solids compared with 8.7 per cent of solids in skim milk, and dilution with rain water and possibly washing water may reduce the percentage to as low as 5.5, so that gallon for gallon it has about two-thirds of the feeding value of skim milk. In addition, out of every 100 gallons of milk used for cheese manufacture only 75 gallons of whey is produced, whereas 100 gallons of milk separated for cream supply to a butter factory produces about 90 gallons of skim milk. As a result of this, the whey from a herd of cows is about half as valuable for pig production as the skim milk from the same herd would be.

Seasonal Nature of Whey as Feed

Fitting Pigs to the Feed Supply

Whey is available from cheese and casein factories from about the beginning of August to the beginning of May, and to get the best return from it it is necessary to organise the farrowing dates of sows so that the maximum number of pigs is on the farm when the supply of whey is at its peak. This is accomplished by having sows begin to farrow some three months before half the herd will have calved and having all sows farrow within six weeks.

Young sows should be mated to have their first litter at the time desired, so that, barring accidents, they will continue to farrow at the correct time while they are members of the breeding herd. When young sows are selected from pigs bred on the farm it is a sound proposition to save more than are actually required for replacements. This covers any possible accidents and young in-pig sows can easily and profitably be sold if they are due to farrow at the right time. In combination with this organising of the farrowing dates of the breeding sows,

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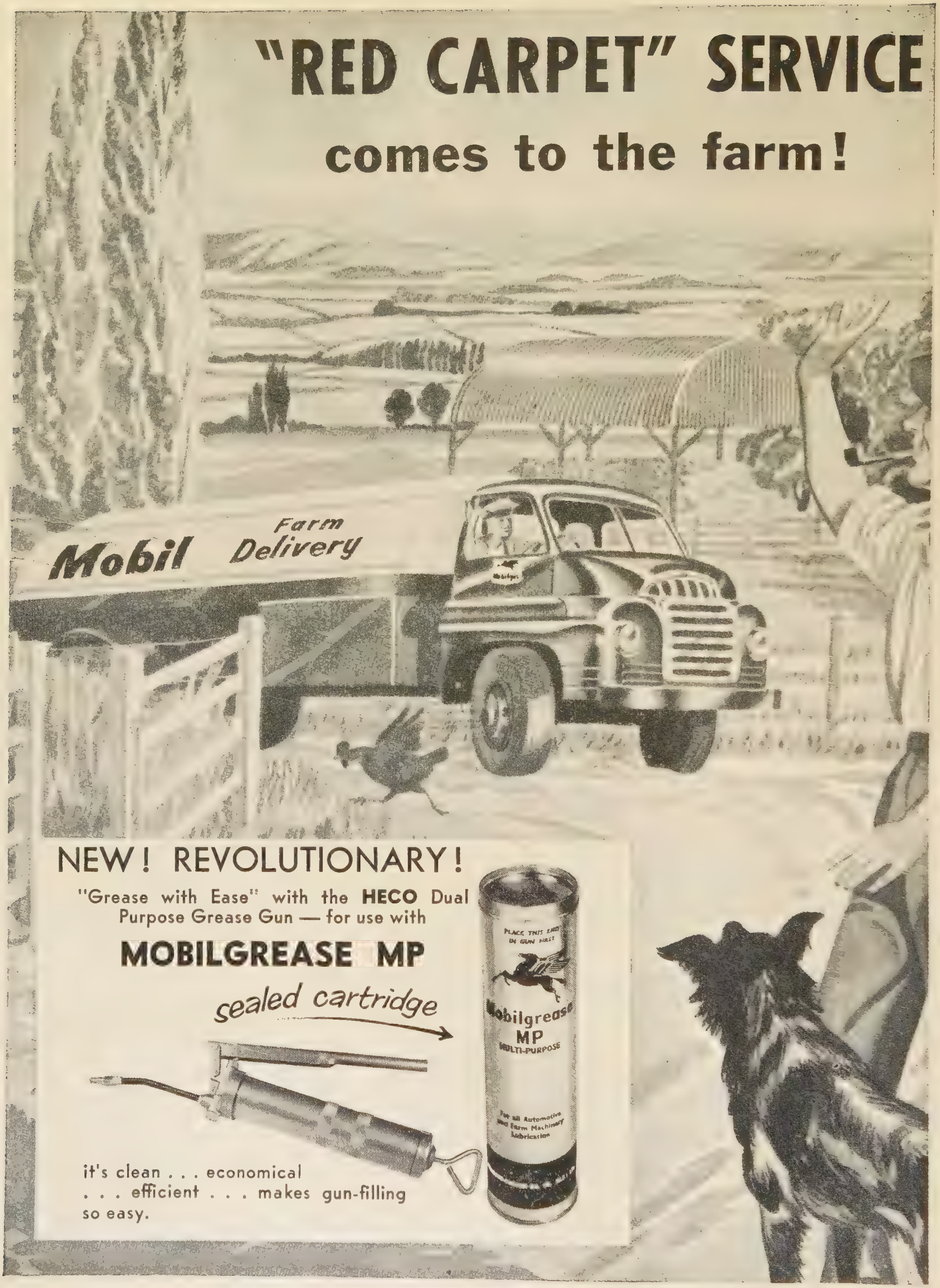
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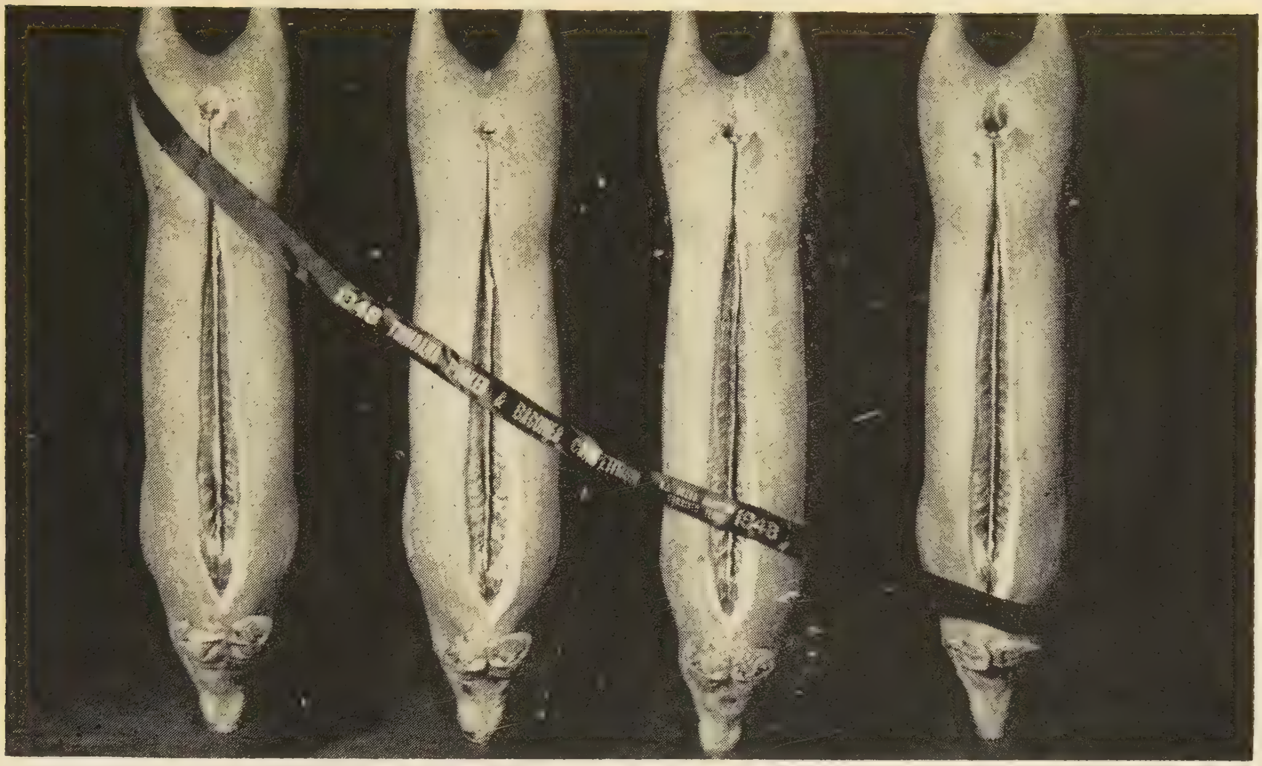
[Sparrow

An example of what can be achieved on whey feeding.

a policy of producing both baconers and porkers is followed.

The object of this is threefold. First, it reduces to a minimum the number of store pigs that have to be wintered. Wintering store pigs is expensive, but to cope satisfactorily with the rapid increase in the supply of whey in spring, the commercial producer must winter a limited number. Second, it ensures a supply of pigs in spring that are growing with the feed supply and can conveniently be taken up to bacon weight; and when the sows farrow their second litter in November the largest number of pigs is on the farm when the supply of food is at its greatest. Third, the disposal of the second litter as porkers during autumn reduces the number of pigs on hand as the supply of whey drops and enables all pigs produced to be sold before the dairying season closes, leaving only the breeding stock on the farm. This system reduces the expenditure on either bought meal or home-grown crop to the minimum and so ensures the maximum return for the whey used.

Using Whey as a Basic Feed

The object in feeding pigs is to produce a first-quality carcass of porker or baconer weight in the shortest possible time, for the highest possible profit. A first-quality carcass is not too fat and is full of lean meat. During the first four months of pigs' lives they build muscle or lean meat more rapidly than fat, and they must have adequate protein in their rations then.

No other domestic animal has the pig's amazing ability to grow. A pig weighing 2½ lb at birth can (and does if properly fed) weigh 180 to 200 lb at six months (equivalent to the weight of a heavy man) and may well reach 350 lb when 12 months old. In eight to nine months its weight can increase 100 times. Taking advantage of this growth rate by careful feeding is the way to success in pig production.

Two very important facts about whey as a feed are (a) that it is an extremely bulky food, 1½ gallons or some 15 lb equalling one food unit, and (b) that it has an excess of lactose or sugar and a deficiency of protein, the former being responsible for the tendency to cause pigs to scour.

Great care must therefore be taken in feeding young pigs on whey when their stomachs are small. Even if whey were by itself a complete food, it would be impossible for young pigs to consume enough of it to provide adequately for their growth. Because it is deficient in protein, a protein-rich supplementary feed is essential to enable them to build lean meat or muscle.

Feeding In-pig Sows

It is essential in feeding in-pig sows that the condition lost while suckling the previous litter is built up again during the first six weeks after weaning and service. The sow must then be held in good condition but not allowed to put on too much fat, and feeding should be increased during the last month before farrowing to allow for the increased demand on the sow made by the unborn litter, which at this stage is growing rapidly. Sows that are carrying their first litter will still be growing, and while care must be taken that they do not get overfat, it is essential that their rations should include enough protein to allow for the growth of both the sow and the unborn litter.

Rations for in-pig sows when whey is used would be as follows:

During the first six weeks after weaning and service, 6 gallons of whey per day (4 food units) supplemented by 2 lb of meal mixture (2 food units) consisting of 1 part of meat meal, 1 part of buttermilk powder, and 8 parts of barley meal. In this mixture pollard may be substituted for half the barley meal or maize (grain or meal) can be used in place of barley meal.

When condition lost has been regained whey can be reduced to 4 gal-

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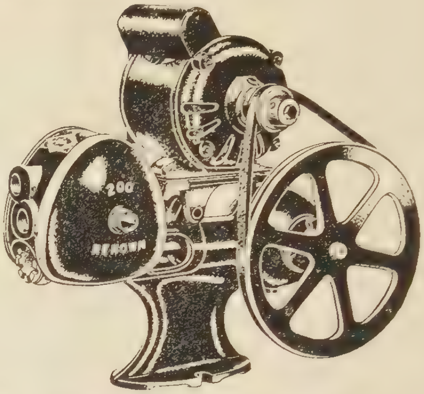

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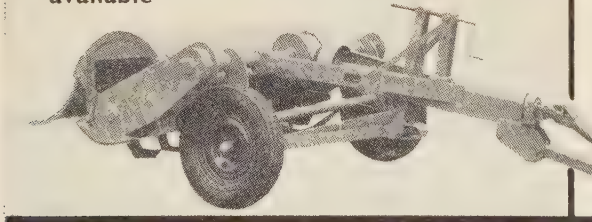

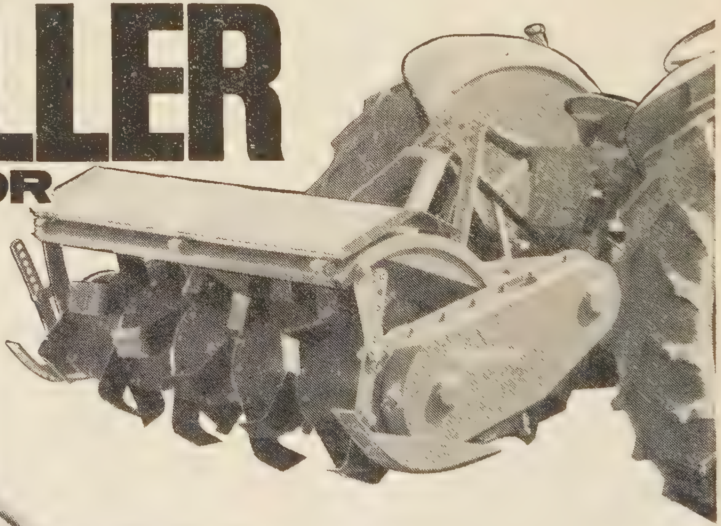

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lons a day and the meal supplement to 1 lb, the aim being to maintain firm condition but to avoid overfattening.

During the last four weeks before farrowing whey should be increased to 6 gallons per day and the meal supplement to 2 lb.

In-pig sows should at all times have as free range as possible on good pasture. Pastures in ideal leafy condition will provide a considerable portion of the sow's rations, but they should be supplemented with 2 or 3 gallons of whey or 1½ lb of meal mixture.

Feeding at Farrowing

For 24 hours before farrowing and 24 hours after farrowing a sow should be fed half rations, but ample clean drinking water should be available all the time. Any signs of constipation should be corrected by the addition of bran or molasses to the rations. It is advisable to cut the rations of very large, heavy sows to half, 48 or even 72 hours before farrowing.

Feeding the Suckling Sow

A sow's requirements while suckling a litter are 4 food units for her own maintenance and 1 food unit for each piglet in the litter, but this level must be worked up to gradually during the first week after farrowing. Thus 24 hours after farrowing the sow should be fed as she was during the last four weeks, that is 6 gallons of whey and 2 lb of meal supplement. If there were eight pigs in the litter, this would be increased during the week to 12 gallons of whey and 4 lb of meal. The sow should be watched to see that she does not start to scour, as any digestive upset that she suffers is sure to be reflected in the progress of the litter. It may be necessary to increase the quantity of meal fed to sows with large litters. The quantity of meat meal or milk powder can to advantage be increased to a third of the meal mixture fed to suckling sows.

Creep Feeding the Litter

The earlier creep feeding is started the better and the bigger the litter is the more rapidly is it likely to outgrow the sow's milk supply. Therefore, the litter must be carefully watched from a week onward to detect any tendency by the young pigs to start to forage for more feed. This can be encouraged by scattering a few pellets of a proprietary starter feed or of meat meal balled with tallow on the clean floor of the creep area, with more in a low-sided creep trough. This should be replaced by a self feeder as soon as the pigs have been introduced to the creep.

The extra care taken to ensure that full intake is maintained to each piglet through the creep is repaid by the most economical feed conversion the pig will ever make (less than 2 lb of food for each 1 lb of live-weight gain) and by the basis being laid for quick growth in the early development stage when the tendency to lean meat production is at its height. The ultimate carcass quality achieved may depend appreciably on this aspect of management.

Some shorter-type pigs have not the capacity for early length development to stand full feeding at this early stage and may carry too much weight for their skeletal development, resulting in their being "pushed out of shape". The remedy is to breed the lengthier type of lean-fleshing pig selected from those which, under liberal creep feeding perform best on growth rate and carcass quality recording.

A litter of pigs suckles from 16 to 18 times during each 24 hours, as frequently during the night as during the day. If food is always available in the creep, piglets will go there and consume some after every suckling. The feed should consist of dry meal mixture in a self-feeder, and a suitable mixture would be 1 part of meat meal, 2 parts of buttermilk powder, and 7 parts of barley meal. Pollard can be substituted for up to half the barley meal or maize meal can be used in place of barley meal. Meal should be put into the self-feeder as soon as the pigs show the inclination for more food so that there is meal in front of them all the time. Whey should not be fed in the creep until the litter reaches the beginning of the fourth week, when 1½ pints per piglet per day should be fed in three feeds in a small trough which must be kept clean. At the beginning of the fifth week whey should be increased to 3 pints per day, at the beginning of the sixth week to 6 pints, and at the beginning of the seventh week pigs which have a free run on grass may get up to 12 pints.

It is necessary, however, to ensure that pigs are clearing up within half an hour the whey they are being given. If they are not, or if they are showing any tendency to scour, the quantity of whey should be reduced. The amount fed to the sow should be kept at the same level (12 gallons daily) or, if necessary, increased somewhat during suckling. If whey is not available, for instance in May and June, the deficiency should be made up with meal and crops.

Feeding from Weaning to Slaughter Weight

At weaning (eight weeks old) pigs should weigh 40 lb live weight, and their food requirement is 2 food units per day. This should be given as 1½ lb of meal mixture and 1½ gallons of whey. The change from ad lib. feeding in a self feeder to a ration of 1½ lb of meal a day must be made gradually over a week or 10 days. During the next four weeks their live weight should increase to 65 lb and their food requirement to 3 food units. The amount of whey given should be gradually increased until at 70 lb live weight they are getting 3 gallons of whey and 1 lb of meal mixture per day. (See the feeding guide below.)

WHEY FEEDING GUIDE

Table of Approximate Food Values

(Standard food unit = 1 lb of barley meal = 1 gallon of skim milk)

Food rich in protein

One food unit =
(d) 1 gallon of skim milk
(d) 1 gallon of buttermilk
(c) 1 lb of skim milk powder
(c) 1 lb of buttermilk powder
(c) 1 lb of meat meal
(c) 1 lb of pea meal
(b) 10 lb of leafy clover pasture
(b) 10 lb of green lucerne
(b) 10 lb of rape

Food deficient in protein, rich in carbohydrates

One food unit =
(d) 1½ gallons of whey
(c) 1 lb of maize or maize meal
(c) 1 lb of barley or barley meal
(c) 1 lb of wheat or wheat meal
(c) 1 lb of pollard
(c) 1 lb of pig porridge
(c) ½ lb of tallow
(b) 5 lb of potatoes (cooked), artichokes, sugar beet
(b) 7 lb of fodder beet
(b) 10 lb of carrots, pumpkins, swedes, chou moellier, mangels

(d) = Liquid dairy by-products
(c) = Concentrate supplementary feed (high value, small bulk)
(b) = Bulky supplementary feed (low value, large bulk)

Principles of Pig Feeding on Whey

Whey is a very bulky food and is deficient in protein. When pigs are young (up to four months old) whey should be supplemented with 1 to 1½ lb per day of a good-quality meal mixture, or meal and grain, of which at least one-third should be a high-protein meal such as meat meal. From four months the amount of meal fed can be reduced to at least ½ lb per day and should be continued at this level until slaughter. Roots and green feed should be used to bolster a falling supply of whey in autumn and for feeding pigs in winter when cows are dry, and should always be supplemented with 1 to 1½ lb per day of meal or grain.

Feeding from Weaning to Slaughter Weight

Age (weeks)	Live weight (lb)	Food units per day	Whey (gallons)	Supplementary meal (lb)
8	at 40	2	1½	1
10	at 50	2½	2	1
11½	at 60	2¾	2½	1
13	at 70	3	3	1
14	at 80	3¼	3½	1
15	at 90	3½	4	1
16	at 100	3¾	4½	1
18	at 120	4¼	5½	½
20	at 140	4¾	6½	½
22	at 160	5½	7	½
24	at 180	5¾	7½	½

All increases in the ration must be made gradually from the start of the stated period.

The above rations are designed for pigs in houses where control of temperature is possible. For pigs run outside or whose housing conditions allow no control of temperature the ration should be increased by ½ food unit per day.

During the next four weeks live weight should increase to 100 lb at 16 weeks of age and food requirements to 3¾ food units per day. The pigs can now consume larger quantities of liquid food and whey can be increased to 4½ gallons during this period and meal kept at 1 lb per day. At this stage there is some advantage in grading pigs into groups according to size to avoid having one or two smaller pigs left in the pen when the rest are disposed of.

To produce a quality carcass and to obtain the highest possible return per gallon of whey used, meal from this stage should continue to be fed at ½ lb per day and whey can be gradually increased to 7 to 8 gallons per day.

If unlimited whey is available at no cost, it is possible to finish pigs after they have reached 120 to 140 lb live weight by feeding whey only. The amount of whey should then never exceed 9 gallons per day at 180 lb live weight or an overfat carcass will result. Under these conditions pigs will take longer to reach the desired carcass weight of 140 lb (190 lb live weight), and this fact plus the extra labour required to hold the pigs longer on the farm must be set against the saving in meal used. Pigs should be finished on whey alone only when unlimited whey is available at no cost and even then it is very doubtful if it is a better paying proposition than feeding ½ lb of meal up to slaughter date. Much will, of course, depend on the housing conditions and the supply of pigs in relation to whey.

Each pig is an individual and advice on the quantity of food required must be used as a guide only. Some pigs will take more, some less, and observation by the feeder and knowledge of the growth rate being obtained are the secrets of success.

Access to Pasture

Pigs being fed on whey do very much better if they are allowed out on good pasture whenever the weather is suitable. Sows and litter must, of course, have access to good clover pasture from farrowing onward, unless the weather is particularly bad. This is still by far the best preventive of anaemia and other piglet ills. Whey-fed pigs will benefit greatly from a run out, daily if possible, right up to the time that they are sent to slaughter. When a run out is not possible hand feeding of green lucerne, fresh lawn clippings, or a green crop is extremely beneficial.

Transport and Handling of Whey

Whey is generally transported from the factory to the farm by truck or tractor and trailer. Containers used may be drums, milk cans, or, more usually today, tanks of 200 or 400 gallon capacity; in a few cases the whey is pumped from the factory to the farm. At the piggery whey is distributed either by bucketing or by a system of pipes and taps, the latter being fed by either gravity or a pump.

Whatever type of container or method of distribution is used, cleanliness is essential for the pigs' health. Whey should be as fresh as possible and all containers should be emptied every day and thoroughly washed out with cold water. If pipes are used at the piggery, they should be thoroughly flushed out with cold water every day. Acidity in whey rises rapidly, and leaving a few inches of stale whey in the bottom of containers is a very bad practice. Many farmers add a few handfuls of agricultural lime daily to the whey to counteract the acidity and reduce the risk of scouring. This practice is recommended.

Management of Pigs in Whey Feeding

The general management of pigs on whey does not differ greatly from their management on skim milk, but with such a large amount of liquid it may be difficult to keep pig houses and feeding yards dry. In totally enclosed pig houses relative humidity becomes very high and there is excessive condensation on roof and walls unless ventilation is ample and drainage good.

Pigs on whey do better if they are run out as much as possible, and their being out all day, except in very bad weather, helps considerably to overcome the problem of excessive moisture. Enough paddocks should be provided to allow for rotational grazing to maintain the pasture. Pigs concentrate on eating out the clover in the pasture, leaving almost pure ryegrass, which is not attractive except in the young, leafy stage.

Whey Powder

In some areas a limited amount of whey powder is available for stock feeding. Trials have shown that it is roughly equal in value weight for weight to barley meal. It should be fed as a meal and not made into a liquid by being dissolved in water. Its value depends on what constitutes the rest of the pigs' ration; it is best used in a ration containing no other milk by-products. It is of less value when used as a supplement to skim milk, and of least value when used as a supplement to whey.

It can be used successfully to replace up to half the barley meal used in creep feeds. But if it totals more than 15 to 20 per cent of the meal mixture, the readiness with which whey powder takes up moisture from the air may cause the mixture to cake and so fail to run properly in self feeders.

Whether to use whey powder or not should be decided on its price compared with that of barley meal. If it is the same price or less, it would be worth while to use it.

Mother Liquor of Whey

A considerable quantity of whey is used in the production of lactose or sugar of milk and a by-product from the extraction process (mother liquor of whey) can be used as a food for pigs. A large amount of this is used in the preparation of mixed proprietary stock foods, but it is available to pig producers at a reasonable cost in some areas. It is a thick, syrupy liquid and has the advantage that it can be stored for a considerable time under proper conditions, and so forms a valuable addition to pigs' rations in winter when no other dairy by-products are available.

Mother liquor of whey is fed by breaking it down with water at the rate of 6 parts of water to 1 part of mother liquor. Its value is two-thirds that of fresh whey and, owing to its concentration and the fact that a considerable portion of the sugar of milk has been removed, it is much richer in protein than fresh whey. It requires supplementing with grain meal, such as barley meal, to obtain a balanced ration.

Efficient Use Gets Good Results

Records kept by practical whey feeders show that those who are making the most efficient use of this food provide about 30 per cent of the total feed supply in the form of supplementary feed. A useful food provision plan is 70 per cent whey, 15 per cent home grown crop, and 15 per cent concentrate meals (of which about one-third should be protein-rich concentrate). The level of production that should be obtained without much difficulty from these proportions of feed should be at least 25 lb of pig meat for each 100 lb of butterfat where whey from the herd of cows on the farm only is used; this means 25 lb of pig meat for each 150 to 180 gallons of whey, depending on the test of the whole milk.

The future prospect of the pig industry is good, as there is a steadily rising demand for pig meat products of all types, and there is every reason for pig producers to organise their business to ensure that the minimum of whey is allowed to go to waste.

Ruakura Farmers' Conference

THIS year's Ruakura Farmers' Conference will be held at the Department of Agriculture's Ruakura Animal Research Station from 13 to 15 June.

Tuesday 13 June will be devoted to subjects of interest to sheep farmers, on Wednesday 14 June the field day for all farmers will be held, and Thursday 15 June will be devoted to dairy farming subjects.

Meeting Veterinary Needs in Expanding Farming Economy

TWO great tasks faced the livestock industries of New Zealand today and presented a challenge to farmers and the veterinary profession, Mr T. Wallace, president of the New Zealand Veterinary Association, told the annual conference of the Association in Wellington in February.

The continuing prosperity of the nation demanded a steady increase in total output to maintain a sufficient exportable surplus in the face of a growing internal population that daily ate more food and occupied more first-class farm land; and overseas markets today insisted on ever higher standards of food hygiene that demanded minimal disease levels in the producing animals.

The farming industries would need a first-class clinical service, great expansion in animal research in its broadest sense, and a vigorous and enlightened extension service.

FACING a future of boundless opportunity, the veterinary profession in New Zealand, now a well established entity after 20 years of rapid and difficult growth, could, by showing wisdom and vision, ensure that veterinary science took its rightful place in the country's progress; or, by drifting, it could find itself playing a minor role.

More Veterinarians Needed

In 1940 there were approximately 75 veterinarians in New Zealand, said Mr Wallace. Today there are about 347, of whom 324 are actively engaged.

Despite this rapid expansion, there remained at February 1961 vacancies for 25 club veterinarians, 15 in Government, and several in private practice.

The value of livestock production in 1957-58 was £314 million, while the export value of produce sent overseas in 1959 was £293.4 million. These figures showed how diminutive the veterinary profession was in New Zealand and that numbers should be greatly increased.

More Receptive Farmers

Changes in farmers' approach to veterinary services in the last 20 years as the result of the pioneering work of the somewhat unique type of clinical practice developed in New Zealand and known as the club system were commented on by Mr Wallace. The early veterinary surgeons had to sell the merits of veterinary practice to a farming community which was sceptical of all scientific aids, veterinary or otherwise.

The old "rough and ready" pioneering spirit among farmers made early progress difficult. Today another generation of farmers had grown up in the presence of a veterinary service which they accepted as normal, and this, with the rise in values of livestock, was rapidly altering the whole approach of farmers to veterinary work. Whereas a few years ago farmers were grateful to obtain the services of any veterinary surgeon, there was now an increasing demand for a very personal veterinarian-client relationship..

"In the last few years we have seen the sterling efforts of all agricultural extension workers rewarded in greatly increased output of primary produce. This has been achieved not only by the factual knowledge dispensed but also by the critical, thoughtful approach engendered in the farmer. A new type of farmer, vastly different in outlook from his predecessors, has gradually been developing during the last decade. It is not surprising that, presented each year with high quality research papers at farmers' conferences and with relatively easy access to all research workers, he has absorbed something of the scientific approach to his own farm problems. Other than the few who despair of science in all fields, not only veterinary, and resort to quackery in all forms (for which, incidentally, high fees are willingly paid), this modern farmer is a pleasure to work with."

Dearth of Researchers

Commenting on the alarming veterinary manpower position in animal research, Mr Wallace said there was

▼ At the New Zealand Veterinary Conference (left to right): Mr T. Wallace, outgoing president, Dr T. S. Gregory, Chief, Division of Animal Health, Commonwealth Scientific and Industrial Research Organisation, Mr W. H. Gillespie, Minister of Agriculture, who opened the conference, and Professor J. Francis, Faculty of Veterinary Science, University of Queensland. Dr Gregory and Professor Francis were official delegates of the Australian Veterinary Association and both gave papers on animal disease control to the conference.

one obvious reason why veterinarians have not been available for research. Overseas schools have not generally developed graduates with a research bent and least of all have they been equipped with an aptitude to study the pasture : animal complex that is the basis of New Zealand farming.

New Zealand veterinary science graduates trained in this environment and with an acute awareness of national problems would undoubtedly develop that necessary research philosophy enabling many of them to enter and initiate the animal research projects of the future.

The international standing of research workers from the New Zealand medical, agricultural, and dental schools gave a clear pointer to the potential of a New Zealand veterinary school.

Tremendous Improvement to Farming by Drugs and Vaccines

"MODERN drugs and vaccines have revolutionised veterinary practice and contributed much to the standing of the profession", said Mr T. Wallace in his presidential address to the New Zealand Veterinary Association's conference. "The tremendous improvement to the farming industries made by modern drugs can perhaps be gauged if we examine one disease alone. Of the total dairy cow wastage in 1938-39 in New Zealand, mastitis represented 22.1 per cent, but in 1955-56 this figure had fallen to 4.7 per cent. There appears to be no limit to the development of new drugs or vaccines. Diseases that today defy treatment are tomorrow brought under control. Pathogenic organisms that up to the present have defied vaccine production will fall to the wiles of bacteriologists, virologists, and biochemists".

Government Consultants

New Zealand's agricultural prosperity owed much to the work of Government veterinary surgeons, who had also kept the country free of any serious animal plague, said Mr Wallace, but in recent years, with the rapid increase in stock numbers and the great call for advice and personal attention, they had been unable to cope with the many demands made on them and were reduced to concentrating on tuberculin testing, supervision of meat inspection, and the control of infectious diseases. As a result farmers had rapidly developed their own advisory services in the form of veterinary clubs and farm improvement clubs.

"In my view," said Mr Wallace, "the Department must soon develop New Zealand counterparts of the veterinary investigational officer of Great Britain. Highly trained and fully informed on all aspects of disease control, animal health, and production, they would act as the consultants of the practising profession.

"If the Animal Industry Division would utilise the practising profession as much as possible in its future disease eradication work, most of which must take place in the autumn, Government officers would be freed to pursue more actively their directive and administrative roles in these programmes. Every overseas country has fully integrated the practising profession into its various disease eradication schemes, and I believe that such a policy will be best for New Zealand and the profession."

Commercial Firms

Describing the establishment of commercial firms producing vaccines and ethical drugs as a highly desirable recent development in this country, Mr Wallace said that at least seven veterinarians were employed in commercial firms in a technical and advisory capacity. Responsible for some research and extension work, this nucleus would be the forerunner of a valuable research group outside Government.

"The contribution of scientists employed by commercial firms overseas to our sum total of knowledge is well known, and we look forward to similar advances in basic and applied research in this country. There is a great need also for new products produced overseas to be proven and adapted for New Zealand farm conditions before being released for sale. To this end I would like to see the various firms establish their own testing farms in this country. . . .

"In this early development period it is to be hoped that competition between firms will not become too fierce, leaving them little margin of profit for investment in research or clouding their appreciation of professional ethics. The profession will support sound ethical products, but any tendency to make exaggerated claims or usurp the advisory role of the veterinarian on the farm will be a disservice to the profession and the farming community. The present time calls for vision and sound judgment on the part of those responsible for commercial policy."

Veterinary Education

Valuable though generous Government bursary schemes for training of veterinary students in Australia had been, few today would feel that such schemes had any chance of supplying New Zealand's veterinary requirements, said Mr Wallace.

"The veterinary profession and, indeed, the whole farming community anxiously await the establishment of New Zealand's veterinary school. Every overseas authority that has visited this country has strongly advocated its immediate founding. The value of livestock production in 1957-58 was £314 million, and although we have no serious animal plagues, the problems of animal health and production are many and the actual wastage from disease has never been measured. It is estimated that in one area of the Waikato, comprising the Waikato, Waipa, and Piako Counties, at least 10,000 cows die per year from mainly metabolic diseases and bloat.

"The FAO conference on veterinary education held last year in London emphasised that graduates educated overseas still require the addition of the necessary specialised knowledge of the particular conditions in their own regions. . . . Everyone working in New Zealand has felt at times how ill-informed he is on the problems of this country. . . .

Merger for "On-farm" Advisory Work

"THE veterinary club and farm improvement club systems could well be merged to provide most of the 'on-farm' advisory work required by the New Zealand farmer".—Mr T. Wallace in his presidential address to the New Zealand Veterinary Association conference.

"I am certain that a New Zealand school carrying out considerable research as part of its function and situated close to other centres involved in agricultural research of various types would graduate many people with the questing minds we so badly need.

"I am equally certain that if the school is not closely associated with agricultural research and teaching and does not develop an approach that measures animal health and disease in terms of output and efficiency of food conversion, then the veterinary profession will take but a minor part in the great surge forward in animal production that must inevitably take place. Neither will the profession be able to supply the specialist workers for an agriculture that is peculiar to New Zealand.

"In all countries it is being recognised that it is essential to provide post-graduate training for all veterinarians, and I am gratified to record that even without a veterinary school as a focal point the New Zealand Veterinary Association has organised two short courses at Massey Agricultural College with the aim of meeting this urgent problem."

Merging of all Sciences

Future work of the veterinary profession in New Zealand, said Mr Wallace, should be in providing leadership and guidance at all levels, from directing small veterinary clubs to shaping Government policy. Farmers could be tutored to recognise and concentrate on important veterinary work and urged to carry out simple husbandry practices themselves. Wasteful use of veterinary manpower should be discouraged in a country that at least cannot afford waste in its scientific personnel. The profession should seek to serve agriculture, by solving problems of animal health and production, where its contribution to the national economy would be greatest.

Veterinary Association Officers

THE following officers were elected at the annual conference of the New Zealand Veterinary Association in Wellington in February: President, Mr D. W. Caldwell, Department of Agriculture, Wellington; vice-president, Dr D. G. Edgar, Ruakura Animal Research Station, Hamilton; members of council, Dr M. B. Buddle, Wallaceville Animal Research Station, Mr K. G. Haughey, Ashburton, Dr H. G. Rees, Whangarei, Mr G. F. Sommerville, Feilding, Mr G. L. Yockney, Papakura. Messrs T. Wallace, Cambridge, immediate past president, and J. Mc. Stewart, Wanganui, representing the Veterinary Services Council, are also members of the council.

Mr D. W. Caldwell (left), president elect of the New Zealand Veterinary Association, and Dr D. G. Edgar (right), vice-president elect.

"We should see that it takes its place in all national disease eradication programmes. Such integration will eventually give the country a practitioner force sufficient for its needs. . . .

"In research, the profession must provide workers able to take their place in the teams that will tackle our livestock problems. We must recognise the ability and great contribution of other scientists, and cooperate in the national effort. . . . I am sure that in the years ahead we shall see a great merging of effort from all the sciences in animal research, livestock production, and extension work. . . . We must study our work as part of the whole field of animal production in a grassland country. The efficient utilisation of pasture by the grazing animal is the basis of New Zealand's prosperity, and, with our agricultural brethren, we should become specialists in this field, as familiar with all the basic concepts in the efficient conversion of pasture to meat, milk, and wool as we are with animal health and disease control."

Veterinarians from U.S.A., Canada, S. Africa Join Department of Agriculture

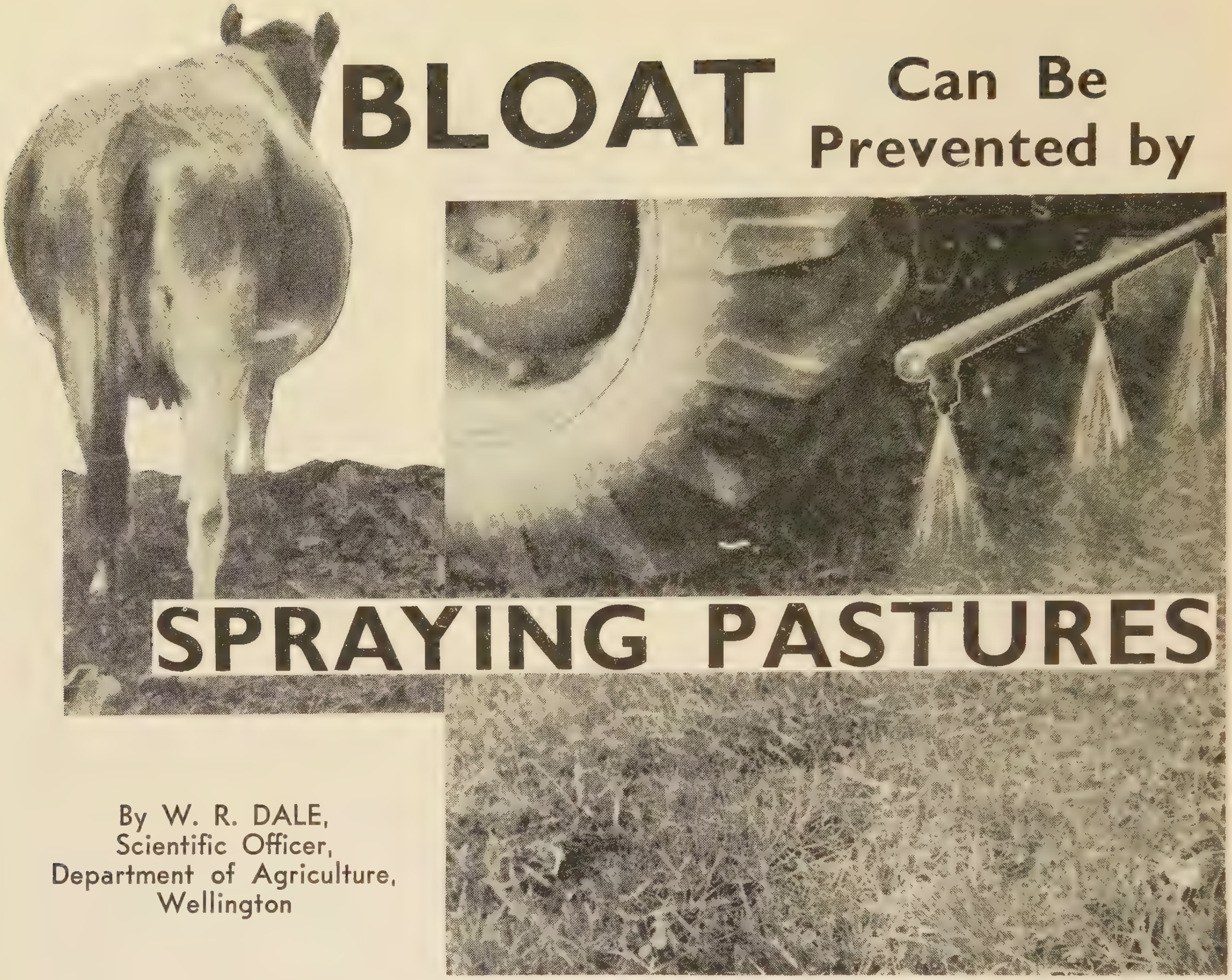
THREE veterinarians from overseas have joined the New Zealand Department of Agriculture recently and a fourth is expected to arrive in late June. Dr G. H. Adlam, from Canada, is now in Dunedin, Dr J. W. Kramer, from U.S.A., in Whangarei, and Mr C. M. T. Meldal-Johnsen, from South Africa, in Hamilton. Dr R. A. Wheeler will go to Auckland when he arrives from the U.S.A.

Dr Adlam, who obtained the degree of Doctor of Veterinary Medicine at Ontario Veterinary College in 1949, has had considerable experience in control of contagious diseases, including tuberculosis, brucellosis, scrapie, and rabies. Dr Kramer graduated last year from Michigan State University as a Doctor of Veterinary Medicine.

Mr Meldal-Johnsen, who graduated B.V.Sc. from the University of Pretoria in 1944, was an officer in the South African Veterinary Corps before becoming a government veterinarian in South Africa.

Dr Wheeler served for a short period with the California Bureau of Livestock Disease Control, but in the last 10 years has been in private practice in California.

BLOAT Can Be Prevented by SPRAYING PASTURES



By W. R. DALE,
Scientific Officer,
Department of Agriculture,
Wellington

EVERY farmer who has experienced even a mild outbreak of bloat will know the worry and distraction bloat has caused him, let alone the losses in production and stock. Each year at least 10,000 dairy cows die from bloat.

THE Department of Agriculture and others have given many demonstrations to farmers to show how easy it is to spray pastures to prevent bloat. The accompanying illustrations show the preparation of the spray emulsion during a "bloat day" demonstration in the Waikato.

Simple Job

The equipment needed can be found on almost every dairy farm and it is a simple job to prepare the materials and spray the pasture; much simpler than staying up half the night or chasing cows up and down the race! Costs, too, are low, being about 3d. per cow per day. Be sure to use only the recommended materials in the correct amount and you will have no difficulty in controlling bloat by spraying.

Solid fats such as tallow or fish frying fat need to be heated and filtered before being emulsified; liquid fats (oils such as paraffin oil, peanut oil, or soya bean oil) do not need to be heated, are usually clean, and do not require filtering.

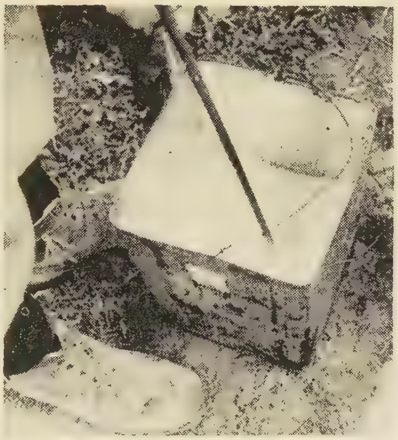
Fats or Tallow

With oils the emulsion is made quickly and easily. If fats are used, heating, filtering, and mixing at first with warm water are extra steps, but costs are almost half. The fats or tallow method is not illustrated on these pages, but your local advisory officers of the Department can help you with it.

SIMPLIFIED SPRAYING METHOD (USING PARAFFIN OIL)

For details of recommended materials and quantities consult your Farm Advisory Officer or refer to Department of Agriculture Bulletin No. 398 "Prevention and Treatment of Bloat in Dairy Cattle".

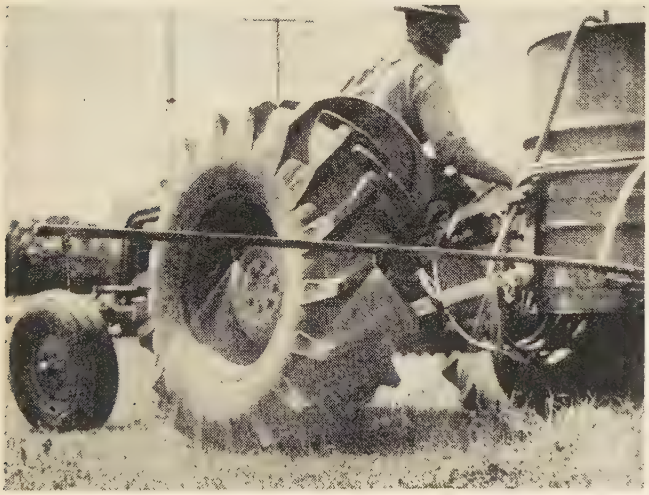
1 Measure out the emulsifier accurately.



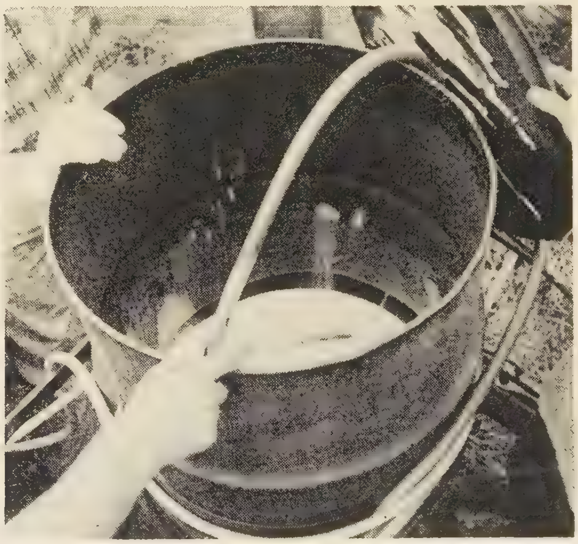
2 Add emulsifier and ½ gallon of water to the paraffin and mix.

3 Run paraffin emulsion concentrate through pump at 40 lb per square inch pressure for three minutes.

CAUTION



Clean spray equipment of weedkillers and check nozzles before use of emulsion. (Here Nos. 1 and 4 nozzles are blocked.)



4 Gradually introduce concentrate into required volume of cold water. Then spray at time of day when pasture is driest, using small droplet size to give even spray over the area to be protected.

Town Supply Herds Certified Free of Reactors to Tuberculin Test

THE following town milk suppliers, whose herds have been tested since 1 January 1961, have been issued by the Department of Agriculture with clear herd certificates declaring that their herds are free of reactors to a tuberculin test.

To qualify for a clear herd certificate a supplier's herd must have no reactors to a tuberculin test of the whole herd. A herd comprises all cattle over six months of age depastured or kept on one property and includes dry or other stock from the property temporarily on a run-off. Where two or more herds share a common run-off all the herds using it have to be tested before any of them can qualify for clear herd certification.

In the list below the figures after each supplier's name and address are the number of the animals tested and these are followed by the date of the test.

These herds will be recorded in the New Zealand Register of Clear Herds, compiled by the Department of Agriculture.

ALLIN, D. B. C., Kaiapoi R.D., Christchurch, 225, 10/1/61
ARMSTRONG, G. A., Ohoka, Kaiapoi R.D., Christchurch, 37, 17/1/61
BANNAN, A. J., Lower Maniatutu, No. 9 R.D., Te Puke, 309, 9/1/61
BATHGATE, D. and G. T., No. 1 R.D., Outram, 44, 23/1/61
BATHGATE, G. T., No. 1 R.D., Outram, 53, 23/1/61
BELL, D. S., Awamate R.D., Wairoa, 96, 9/1/61
BENNETT, A. E., P.O. Box 19, Te Horo, 35, 5/1/61
BEVAN, V. H., Main Rd., Manakau, 70, 12/1/61
BLYTH, B. T. and F., Rototai Rd., Takaka, 166, 9/1/61
BOWDEN, S. T., Crosses Rd., Havelock North, 20, 19/1/61
BOWLING, S., P.O. Box 4, Ohau, 74, 9/1/61
BRODRIBB, A., Meeanee, 35, 21/1/61
BROKENSHIRE, F., 29 Lynton Rd., Glen Eden, 76, 16/1/61
BRYANT, W. J., Henley, No. 1 R.D., Outram, 66, 6/1/61
CAMPBELL BROS., P.O. Box 67, Manakau, 133, 3/1/61
CHESMAR, G., Fountains Rd., Prebbleton, 18, 9/1/61
CRAWFORD BROS., Brighton Rd., Green Island, 47, 19/1/61
DAKERS, D. R., Puketapu, R.D. 3, Napier, 45, 4/1/61
DENTON, Mrs A., P.O. Box 31, Otaki Rly., 91, 8/1/61
DONOVAN, P. H., Te Hauke, P.B., Hastings, 7, 13/1/61
DORNE, J. C., Kimberley Rd., Levin, 72, 30/1/61
ELLMERS, H. H., Kaiapoi R.D., Christchurch, 30, 17/1/61
ERIKSEN, H., P.O. Box 25, Manakau, 138, 10/1/61
FARNDON HOHEPA FARM SCHOOL, Napier Rd., Clive, 17, 15/1/61
FLETT, K. A., Pine Hill, Dunedin, 23, 13/1/61
FORD, F. A., Pine Hill Rd., Dunedin, 61, 19/1/61
FORSYTH, I. N. M., Wylie's Crossing, Mosgiel, 35, 6/1/61
GAINSFORD, C. H., P.O., Prebbleton, 36, 9/1/61
GREENE, C. W., Waiohiki, R.D. 2, Hastings, 79, 19/1/61
HAASE, O. L., Globe Hotel, Waitapu, Takaka, 2, 16/1/61
HAIGH, D. W., Ihakahakuene Street, Manakau, 85, 9/1/61
HANDLEY, R. G., Rapanui Rd., Wanganui, 163, 30/1/61
HARRISON, A. E., Ferry Rd., Clive, 31, 19/1/61
HART, S., R.M.D. Takaka, 144, 10/1/61
HAYDON, G. C., Barrytown, 37, 15/1/61
HELLYER, D. J., Macandrew Bay R.D., Dunedin, 52, 20/1/61
HERRICK, A. S., Motupipi Rd., Takaka, 50, 9/1/61
HILL, B. H., R.M.D. Takaka, 69, 17/1/61
HOBSON FARMS LTD. (Farm No. 3), Wharepapa, 129, 30/1/61
HOLMES, R., Berwick, No. 1 R.D., Outram, 69, 5/1/61
HOOD, C. H. J., No. 6 R.D., Piaka Rd., Koputaroa, 55, 6/1/61
HUNT, L. T., P.O. Box 33, Otaki Rly., 125, 9/1/61
HUSSEY, J. F., Rapanui Rd., Wanganui, 42, 30/1/61
INCH, E. J., Woodend Rd., Rangiora, 57, 16/1/61
JENKINS, G., P.O. Box 61, Manakau, 115, 2/1/61
JORDAN, L. N., Kairau Rd., Sentry Hill, New Plymouth, 68, 17/1/61
KILSBY, J. A., Queen Street, Levin., 118, 24/1/61
KNIGHT, L., South Rd., Manakau, 48, 30/1/61
KORNER, S. J., Main South Rd., No. 2 R.D., Mosgiel, 35, 5/1/61
KREBS, A. J., Fernhill, R.D. 3, Napier, 93, 15/1/61
LARSEN, C. M., South Rd., Masterton, 39, 24/1/61
LEA, K. V. L., Bluff Hill Rd., Runciman, R.D., 54, 23/1/61
LONDRIGAN, L. M., R.D. Owhango, 106, 20/1/61
MADDEN, C. T., Judgeford, Pauatahanui, 122, 13/1/61
MANIAROA FARMS LTD., Patutahi R.D. Gisborne, 145, 23/1/61
MARCHANT, C. A., Pembroke Rd., Stratford, 150, 21/1/61
MARSHALL, A. C., R.D. Kokatahi, Hokitika, 73, 8/1/61
McINTOSH, F., and sons, Flaxton, Kaiapoi, 102, 9/1/61
McINTYRE, C. P., Manganoho, Taihape, 139, 24/1/61
MOFFATT, E. H., Est. of, Main Rd. North, Otaki, 206, 30/1/61
MONK, A. C., Lower Kokatahi, Hokitika, 77, 12/1/61
MORRISON, H., Henley, No. 1 R.D., Outram, 75, 5/1/61
MT. ALBERT GRAMMAR SCHOOL, Alberton Ave., Mt. Albert, 31, 13/1/61
NICHOLLS, S. L., "Birchlea", St. Arnaud, R.D. Nelson, 10, 7/1/61
NIXON, A. J., Whenuapai, 2 R.D., Kumeu, 65, 14/1/61
PAISLEY, A. J., Waitati, Port Chalmers R.D., 41, 13/1/61
PATTERSON, J. A., Kilmog, R.D. Waikouaiti, 13, 12/1/61
PEARSON, E., R.M.D. Motupipi, Takaka, 52, 16/1/61
PEASE, P. B. and R. M., Rawhitiroa Rd., Eltham, 181, 16/1/61
POLLARD, David J., P.O. Box 69, Otaki, 98, 16/1/61
POWER, L. H., Flaxton, Kaiapoi, 58, 9/1/61
REILLY, K. B., Commercial Street, Takaka, 34, 10/1/61
REILLY, P. R., Waitapu, Takaka, 113, 16/1/61
RHODES, Mrs R., Grehan Valley, Akaroa, 2, 12/1/61
RICHARDS (Barrytown) LTD., Barrytown, Greymouth, 83, 15/1/61
RIVERSIDE COMMUNITY TRUST BOARD, R.D. 2, Upper Moutere, 74, 13/1/61
ROBERTSON, J. L., No. 1 R.D., Outram, 99, 24/1/61
ROWAN, P. D., Valley Rd., Dargaville, 36, 19/1/61
RYAN, E. R. and M. I., Waitoki, R.D. Kaukapakapa, 150, 3/1/61
SIMPSON, H. K., Puketapu, R.D. 3, Napier, 64, 3/1/61
SMAILL, R. G., County Rd., Blackhead, Otago, 32, 19/1/61
SMITH, H. B., Kimberley Rd., Levin, 45, 30/1/61
SMITH, W. W. A., Pigeon Flat Rd., Waitati, 94, 12/1/61
SPROTT, Mrs J., Henley, No. 1 R.D., Outram, 43, 5/1/61
STEELE, C. W., Charles Rd., Karaka R.D., 46, 17/1/61
STEVENS, M. N., Waitoki, R.D. Kaukapakapa, 86, 16/1/61
STEVENSON, W. B., Otokia, No. 1 R.D., Outram, 98, 17/1/61
STEWART, D. E., Jesmond Rd., Drury, 28, 9/1/61
STUART, J. B., Highcliff, No. 3 R.D., Dunedin, 23, 20/1/61
SWAFFORD, G. V., R.M.D. Takaka, 60, 17/1/61
TAYLOR, G., Hilton, R.D. Temuka, 48, 24/1/61
THOMPSON, F., P.O., Makarewa, 38, 23/1/61
THOMPSON, F. B., Merton, 1 R.D., Waikouaiti, 32, 12/1/61
VAN NOORDT, J., R.D. 3, Putaruru, 179, 3/1/61
WELLS, C. R., Ketemarae Rd., Eltham, 57, 3/1/61
WILSON, W. W., Waiohiki, P.O., Taradale, 47, 15/1/61
WILTON, L. R., Est. of, Rangitumau, R.D. Masterton, 111, 25/1/61
WORSFOLD, G. H., Jesmond Rd., Drury, 30, 16/1/61
YULE, D. A., Ormond Rd., R.D. 5, Hastings, 70, 13/1/61

◆

Dairy Produce Graded for Export

THE following figures showing quantities of dairy produce graded for export during January 1961 and for the six months ended 31 January 1961 with comparative figures for the same month and for the six months of 1959-60 have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:

BUTTER

Period	Creamery (tons)	Whey (tons)	Total (tons)	Percentage increase
January 1961	19,162	365	19,527	
January 1960	18,606	340	18,946	
Increase	+556	+25	+581	+3.066
6 months ended 31/1/61	122,686	2,142	124,828	
6 months ended 31/1/60	118,967	2,064	121,031	
Increase	+3,719	+78	+3,797	+3.372

Butter in store at 31 January 1961 was 38,710 tons.

CHEESE

Period	White (tons)	Coloured (tons)	Total (tons)	Percentage increase
January 1961	10,709	509	11,218	
January 1960	9,226	1,117	10,343	
Increase or decrease ..	+1,483	—608	+875	+8.459
6 months ended 31/1/61	55,280	6,567	61,847	
6 months ended 31/1/60	52,876	7,270	60,146	
Increase or decrease ..	+2,404	—703	+1,701	+2.828

Cheese in store at 31 January 1961 was 22,792 tons.

If these figures are converted into butterfat equivalent, there is an increase of 3.081 per cent in butterfat graded for the six months as compared with the preceding season. The above figures refer only to butter and cheese graded for export and do not include butter and cheese which is used on the local market and products such as anhydrous milk fat, whole milk powder, and other whole milk products, and are not necessarily a true indication of production trends.

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Vegetable Growing for

Home and Market Gardeners

PEAS

By A. G. KENNELLY,

Horticultural Instructor, Department of Agriculture, Dunedin

GARDEN peas (*Pisum sativum* var. *hortense*) belong to the legume family. They do not thrive in hot, dry weather and grow best in cool but not excessively cold conditions. They are hardy to moderate frosts, but frost may damage flowers or greatly retard blossom and pod development, and frost after a mild period during which soft growth has developed may damage the haulms. Pea seed will germinate at relatively low temperatures, the minimum temperature being about 40 degrees F, though the optimum temperature for germination is about 75 degrees. The garden pea is classed as a herbaceous annual with a trailing, climbing, or bushy habit and nodules are usually formed on the roots by nitrogen-fixing bacteria.

PEAS do best in the rotation after grass or a cereal. For optimum yield and quality high fertility should be maintained.

If peas are grown in rotation with potatoes and it is desired to maintain a relatively low pH, 4 or 5 cwt of ground limestone drilled with the pea seed will raise the general pH level enough to suit the peas without increasing the development of scab on the potatoes.

Peas are regarded as a soil improving crop because they are a legume and by bacterial action store nitrogen obtained from the air as complex protein compounds in their root nodules. When the plant dies these nodules are broken down by soil bacteria to form soluble nitrogenous compounds readily available to the following crop.

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Soil and Manure

Peas are grown on many kinds of soil from light sandy loams to heavy soils. Sandy loams are preferred for early crops. Peas grow best in well cultivated, well drained, moist soils that contain plenty of humus and are well supplied with potash, phosphate, and nitrogen. Good drainage is essential, as the pea plant will not do well on poorly drained, poorly aerated land. Where the land can be irrigated the texture of the soil is of little importance if the soil is well drained.

Uniformity of soil is specially important for crops for canning or deep freezing to avoid unevenness of maturity. The surface should be smooth and free from clods so that the drill sows all the seed at the same depth.

The pea plant does not thrive in highly acid soils and when the soil is more acid than pH 5.5 lime should be applied. The range of desirable reaction is between about pH 5.5 and pH 6.5. Soils vary in the amount of lime needed to change the pH by a given amount; a clay loam may need four times as much lime as a sandy soil, with a silt loam intermediate in needs, so a soil test is necessary where the pH of the soil is not known.

Fertiliser dressings commonly given in some of the main districts where peas are grown are given below.

Pukekohe: 4 to 8 cwt per acre of a mixture containing 80 per cent of serpentine superphosphate and 20 per cent of sulphate of potash.

Auckland: No fertiliser on soils well fertilised for the previous crop; otherwise bonedust at 5 cwt per acre.

Levin: No fertiliser in some instances; otherwise 10 cwt per acre of blood and bone or superphosphate, or an application of fowl manure.

Manawatu: Follow brassicas and not specially manured.

Ohakune: Up to 15 cwt per acre of proprietary fertiliser applied whether the crop follows brassicas or not.

Hawke's Bay: 3 cwt of superphosphate and ½ cwt of sulphate of potash per acre.

Nelson: 2 cwt of blood and bone, 2 cwt of superphosphate, and 1 cwt of sulphate of potash per acre.

Christchurch: Superphosphate mainly at 2 to 3 cwt per acre.

Dunedin: Up to 15 cwt per acre of blood and bone or 2 to 3 cwt per acre of reverted superphosphate.

Fertiliser Placement

Garden peas are comparatively short lived plants and the root system does not range widely. Fertilisers must be in the immediate root zone for maximum benefit and it is common practice to drill the fertiliser with the seed, but the amount and kind of fertiliser that can be drilled are limited, because of risk of seed injury.

SOWING OF PEA CROPS

The sowing of peas in 21 in. drills allows inter-row cultivation to control weeds in the early stages of the crop.

Carbonate of lime and limited amounts of basic or serpentine superphosphate are commonly drilled with the seed with good results. Where the rows are close fertiliser can be broadcast. Where rows are wider it can be drilled about 1 to 1½ in. under the seed or in a band or in bands 1 to 2 in. from the side or sides of the rows.

Sowing

A bushel of peas weighs about 60 lb and peas are usually sown at 3 to 4 bushels to the acre depending on variety, row spacing, and viability of the seed. Large-seeded varieties may be sown at 5 bushels to the acre. Generally the depth of sowing is about 1 to 1½ in. in the heavier soils and about 1½ to 2 in. in the lighter soils, but shallower sowing (1 in.) is preferred for early crops in clean, well prepared, even ground, because the surface moisture of the soil is then generally sufficient and the peas will germinate more quickly in the warmer soil close to the surface.

Peas for processing may be sown with a grain drill in the same way as oats or other small grain, the rows usually being 7 in. apart. But they are also sown in 15 to 20 in. rows, and for hand picking the rows may be from 21 to 30 in. apart or in double rows at 28 in. centres. With the widest spacing little more than a bushel of peas may be needed to sow an acre.

Other factors being equal, planting rate can be more conveniently computed at plants per yard of row than at bushels per acre because of the differences in seed size. The best planting rate should be determined for each variety on the basis of habit of growth, whether single stemmed or branching, and an extra allowance of seed should be made for the percentage of germination of the seed sample. Usually 10 to 15 per cent of extra seed should be allowed for the reduction in field emergence compared with the laboratory test.

Seed Protection

Pre-emergence damping-off, which is the failure of the seeds to germinate or of seedlings to emerge, and post-emergence damping-off, which is the death of the seedlings after emergence, may be caused by soil-borne fungi, bacteria, or insects, or by seed-borne fungi or bacteria. Damping-off is a common trouble but may be guarded against by seed treatment.

For control of diseases, thiram, captan, or chloranil is used by growers,

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and where insect pests are troublesome it is occasionally necessary to treat the seed with DDT or lindane dusts. The quantity of the appropriate seed dust to be applied is measured in relation to the weight of the seed. Small-scale mixing presents few difficulties, but mixing of large quantities is better done by the merchant handling the seed, who will have facilities to deal with the large amount of poisonous material safely.

Soil conditions have an important effect on the susceptibility of seeds and seedlings to disease. With high temperatures and moderate soil moisture, which encourage rapid germination and strong seedling growth, use of untreated seed is often satisfactory. When cool and wet soil conditions delay germination of seed and emergence of seedlings, seed treatment is essential.

Strong, healthy plants produced under favourable conditions from treated seed are usually less subject to disease attack than less vigorous plants grown from untreated seed.

Main Varieties of Peas Grown Commercially in New Zealand

	Pukekohe	Auckland	Otaki-Levin	Manawatu	Hawke's Bay	Nelson	Christchurch	Dunedin
William Massey		C	C		C	C	PC	C
Greenfeast	C	C		C	C	C	PC	C
Victory Freezer	P	C		C	P	C		
Onward							C	
Dark Skinned Perfection ..							P	
Twenty Nine							P	
Wyola	P				P			
No. 75					PC			
Stratagem					C			
Little Marvel					C	C		

C, commercial; P, processing

Cultivation

Ground for peas should be clean and very little cultivation or other weed control should be necessary, but the pea field should be rolled immediately after sowing with a light roller to settle the soil uniformly round the seed. This facilitates uniform germination and pushes surface stones into the soil so that they do not interfere with the mower cutter bar at harvesting.

Where chemical weed control is not done peas are usually harrowed when the plants are about 3 in. high. The tractor is usually driven slowly across the rows at right angles to the line of the drill and if the ground is cloddy the crop may be immediately rolled with a Cambridge roller to consolidate the topsoil and facilitate cutting later.

Weed Control by Chemicals

Weed competition in the early stages of growth of the pea crop may affect yield severely. Harrowing is commonly done, but many growers now spray with either a hormone or a phenol preparation. The hormone MCPB is translocated within the plant and is therefore suitable for use on perennial weeds such as Californian thistle. MCPB also controls many annual weeds, but not all, and this limits its use. An advantage of it is that the stage of growth of the weeds, the weather, and the quantity of water used in spraying are not critical.

The alternative material, the phenol derivative dinoseb (DNBP), is a contact weedkiller and kills only the parts of the plant with which it comes in contact, so it is unsuitable for perennial weeds, though it controls a wide range of annuals.. It must be used when the weeds are very young and the temperature suitable, and to maintain a margin of selectivity between the weeds and the crop a higher rate of water is needed than with MCPB. Dinoseb is poisonous and is a vivid dye, so is more unpleasant to use than MCPB.

Where very young susceptible annual weeds are present and can be sprayed in suitable weather, control with dinoseb is satisfactory, but if perennial weeds susceptible to hormones are present or if annual weeds have passed the stage of growth for control with dinoseb, MCPB must be used.

All varieties of peas will tolerate MCPB at up to 1½ lb of acid equivalent per acre, but spraying should be done as soon as possible after the crop has developed four nodes and before flowering begins. Early varieties such as William Massey are most susceptible to damage.

If a combination of weeds difficult to kill with MCPB (such as redroot (*Amaranthus* spp) and wild turnip) and dinoseb (such as Californian thistle) exists, a combination of MCPB and dinoseb may be used. A suggested mixture is 8 oz of MCPB and the appropriate rate of dinoseb for the prevailing conditions. This is probably sounder practice than using MCPA at rates up to 12 oz, though local trials should verify this first. Monochloroacetate at 10 lb and MCPB at ¾ lb as a mixture is highly promising on peas.

Both TCA and propham could be used as pre-planting applications for control of grass weeds at 5 lb and 3 lb per acre respectively. Both chemicals should be mixed with the soil about three weeks before drilling. If TCA is used, care should be taken in using dinoseb as a pre-emergence application, as the effect of TCA is to reduce the cuticle density, making the crops more susceptible to damage.

Yields

A good crop may be 3 tons of green peas plus 6 tons of foliage, though in most districts where peas are grown crops would average only about half of that. Good yields of shelled peas for processing are from 1 ton to 25 to 30 cwt to the acre, though very much higher yields are not uncommon under the most favourable conditions.

Maturity

Maturity dates for peas are only a guide. Early sown peas will take longer to mature under the cooler conditions prevailing than the same varieties sown under warmer conditions. Maturity times given are for October sowing.

Varieties

Little Marvel: A hardy dwarf early variety 18 in. high which performs better under adverse seasonal conditions than William Massey. The pods are dark green, short and blunt, frequently borne in pairs, and well filled with even sized peas. Comparative maturity, Levin, 63 days.

William Massey: A very good early dwarf. The pods are a little longer than those of Little Marvel, pointed, and only slightly curved. The peas are inclined to vary in size, but are of a good dark colour, sweet, and suitable for quickfreeze. The foliage is dark green and rather susceptible to disease, though the variety is resistant to pea mosaic. The plant is slightly taller and less hardy than Little Marvel. It is the main early pea for local market garden use and for export. Levin maturity, 60 days.

Greenfeast: A main-crop variety grown in all parts of New Zealand. It is popular for market, canning, and freezing, mainly because of its hardiness and ability to crop under adverse conditions. It is one of the few common garden peas with yellow cotyledons. The pods are curved and pointed and tend to ripen unevenly. It is a heavy yielder and the colour and quality of the peas are good, but they tend to be uneven in size. Levin maturity, 71 days.

Victory Freezer: A variety that ranks with Greenfeast as one of the most extensively used canning peas in New Zealand. Selections include

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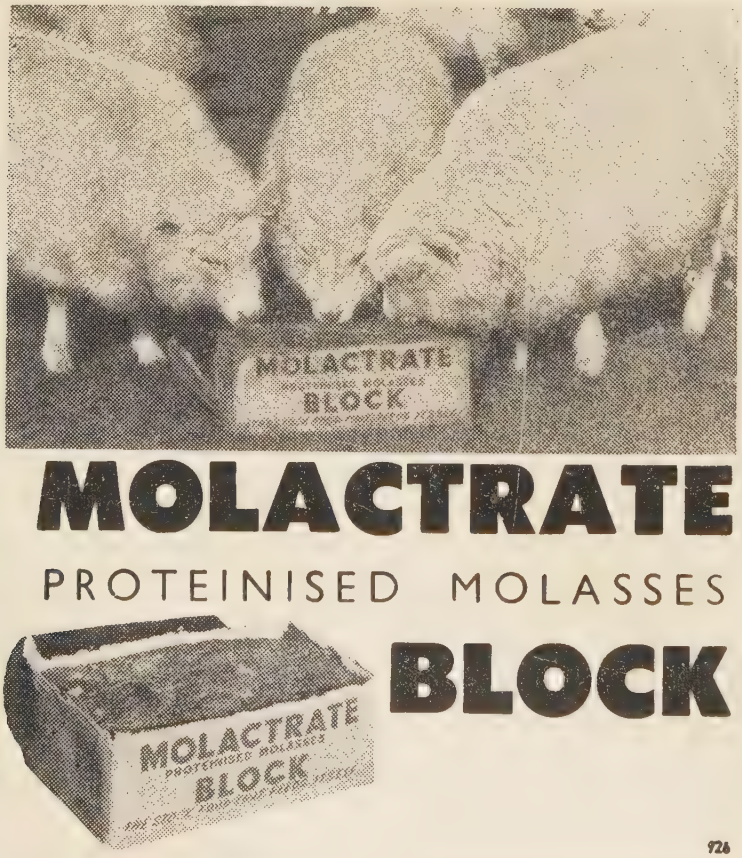

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Canner 75. Its principal virtues are heavy yield and the pods mature evenly, the large peas within the blunt, pointed pods being practically all the same size. It is useful for marketing fresh or for processing, as most pods can be harvested at a single picking. The peas tend to become starchy if overmature. Levin maturity, 73 days.

Onward: A good yielding mid-season or main-crop variety about 30 in. high suitable for table use. The pods are large, puffy, medium light green, and blunt and the peas of good flavour. Maturity is reached in 77 to 88 days.

Stratagem: A heavy cropping, late maturing variety (maturity, 80 to 90 days) that is very susceptible to pea mosaic. The foliage is fairly heavy, with large dark green leaves. Height about 36 in.

Wyola: A specially developed freezing and canning pea. The pods are blunt, mainly straight, thin-walled, and well filled with seven to nine small dark green peas. The plants are of medium length, the pods dark, with many double pods.

Canner 75: A selection of Victory Freezer (see above).

Twenty Nine: Similar to Victory Freezer except that vines are slightly shorter and it matures a little earlier.

Dark Skinned Perfection: Height 30 in. to 36 in. with dark green foliage; pods straight and usually in pairs each containing seven to nine peas. The cotyledons are green. The variety is very susceptible to pea leaf roll, but is resistant to fusarium wilt. Levin maturity, 71 days.

Diseases

Control of disease in peas depends on crop rotation and sanitation, treatment of seed with a suitable protectant (see page 359), and the use of resistant varieties, particularly as a defence against pea wilt. Most of the varieties developed primarily for canning and quick freezing are resistant to wilt, and resistant strains of Greenfeast and Onward are rapidly replacing the susceptible ones. Growers can consult their local Horticultural Instructor if in doubt about a variety's resistance. Detailed information on diseases is given in the bulletin "Diseases of Peas and Beans in New Zealand and Their Control" (published by the Department of Scientific and Industrial Research), which can be ordered through booksellers.

Pests

Slugs and snails are active under wet or humid conditions and consequently are troublesome at night. They can be controlled by a metaldehyde bait made by mixing 2 oz of metaldehyde and 5 lb of bran, which should be broadcast at 50 lb per acre. It should not be applied when rain appears imminent, as heavy rain will so dilute it as to make it ineffective.

Peas are rarely troubled by other pests, but the following occasionally attack crops (some appropriate materials for control are given in brackets):

Aphids (nicotine sulphate or malathion or lindane).

Millepedes (aldrin emulsion or DDT).

Green vegetable bug (malathion or DDT).

White fringed beetle (dieldrin 2 lb per acre or aldrin 2 lb per acre).

Red legged earth mite (DDT or malathion).

Red spider mite (malathion or dieldrin emulsion).

Tomato fruitworm (DDT or dieldrin or malathion).

May Work in the Home Garden

By A. G. KENNELLY

MAY, the end of the main growing season for most home gardeners, is usually a quiet month in the garden. The most urgent work is usually the sowing of broad beans and the setting out of cabbage for spring use. Cauliflower and lettuce plants can also be set out where winters are not too severe.

SOME sowing and planting may be done if the soil is well drained and cultivated. Where firming of soil is necessary, it should be confined to seed or plant rows and with medium and heavy soils done only in moderation. A simple method of testing soil conditions for sowing is to walk on it. If it sticks to the soles of the boots, it is too wet.

It is not advisable to plant or sow even hardy vegetables in cold situations where the soil is heavy and poorly drained. Temperature and other aspects of the weather are not usually so favourable that the plants should be subjected to the additional hazard of a cold, wet soil if this can be avoided.

Spring cabbage can still be set out and, where conditions are favourable, cauliflowers and lettuce also. Broad beans and spinach can be sown and in some districts peas, but unless the garden is in a very favourable situation and the weather is very good, it is best to defer sowing most vegetable seeds until July, August, or September according to conditions.

Asparagus should be cut down as soon as the foliage begins to turn yellow and kumara and potato crops should be dug without delay. Potatoes and other root crops in store should be sorted over to remove those with rots.

Usually digging and much tidying is needed in the home garden in May, as the residues of half-hardy crops such as tomatoes, peas, marrows, pumpkins, and potatoes have to be cleared away and the land they occupied dug over.

Vacant ground can be sown with a hardy green crop such as oats or barley and, if necessary, limed. Attention should be given to the compost heap and diseased or woody rubbish burnt.

Rhubarb beds should be weeded and the seed stalks removed. Rhubarb plants with mottled or streaky leaves, indicating virus disease, should be dug out and burnt.

Weeds among crops or round the edges of the garden should be destroyed. They may be the means by which pests such as thrips, mites, and aphids, which are often considered more serious than weeds, are carried over from season to season.

They may also serve as host plants for virus and fungous diseases which could infect the next season's crops.

Broad Beans

Broad beans are usually sown in May. Though they will grow in a wide range of soil types, broad beans do not produce first-class crops in soils which are too wet or those which tend to dry out too easily. They do well in fairly heavy, moist, well drained soils that have been well cultivated. If the soil lacks organic matter, a moderate amount of material such as compost or well rotted farmyard manure should be worked in.

Broad beans usually need only a small amount of nitrogen. A mixture of 1 part of sulphate of ammonia, 4 parts of superphosphate, and 1 part

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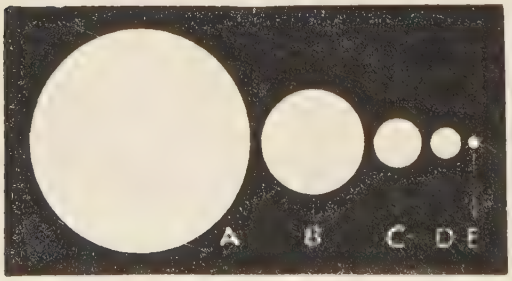

A—Particle of typical domestic flour.

B—Particle of high quality face powder.

C—Size of a Red Blood cell in the human body.

D and E—Typical particles of TARTAN FENODREN Phenothiazine.

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of sulphate or muriate of potash, all by weight, or alternatively 3 parts of blood and bone, 2 parts of superphosphate, and 1 part of sulphate or muriate of potash worked in at 2 to 3oz to the square yard, according to the fertility of the soil, will give good results on most soils.

On soils that have been well dressed with balanced fertiliser for previous crops, superphosphate alone may give satisfactory results. In districts with moderate to heavy rainfall growth in most soils not recently limed will be improved if carbonate of lime at about 2 to 4 oz to the square yard is worked in some time before sowing.

In well drained soil broad beans are best set 2 to 3 in. deep, preferably with a trowel, and 4 to 6 in. apart, or in the bottom of a drill about 3 in. deep.

The seed may be planted in double rows 10 to 12 in. apart with not less than 26 in. between each double row. Single rows should be 15 to 18 in. apart.

A little less than a quart of seed of standard varieties will sow about 50 ft of double row.

The two main varieties of broad beans grown in New Zealand are the broad podded or Windsor type and the long podded types, but in recent years strains of broad beans of Spanish origin have been introduced and have given outstanding results in yield and earliness.

Dwarf varieties of broad beans are also grown. The pods contain about four small seeds and are usually attached in fan form. The foliage is small, often fairly dark, and internodes very short. Examples of the type are Cole's Early Dwarf and Dwarf Gem.

Brussels Sprouts

Brussels sprouts should be harvested regularly by the removal of sprouts as they reach full size. The bottom sprouts should be gathered first. Leaves should be removed from the base as they turn yellow. Plants in exposed situations may have to be staked, as they usually tend to become top heavy with leaves and sprouts as harvesting progresses.

Lettuces

Like most salad crops lettuce should be grown quickly. At this time of the year, when in most districts conditions are not good for growth, friable, well cultivated land rich in well rotted organic matter such as farmyard manure or compost is desirable for growing plants in or for setting them out.

Lettuces for setting out in early spring can be sown in May in a favourably situated cold frame or in a favourable situation in the open where the soil is well drained. Where these conditions are lacking it is usually best to defer sowing until July or August. Growth of lettuce is slow in May, and the plants should be kept weed free and the soil between the rows should not be packed excessively by treading on it.

Meteorological Records for February

Station	Height of station above M.S.L. (ft)	Air temperatures in degrees (Fahrenheit)				Rainfall in inches					Bright sunshine hours
				Absolute maximum and minimum					Maximum fall		
		Approx. mean	Difference from normal	Maximum	Minimum	Total fall	No. of days of rain	Difference from normal	Amount	Date	
Kerikeri	240	65.5	—0.1	79.3	48.6	2.83	13	—1.1	0.84	22	153
Auckland	160	67.0	+0.3	78.9	52.3	3.18	8	—0.9	2.09	23	193
Tauranga	12	66.4	+1.4	77.2	44.1	1.22	10	—2.3	0.32	23	214
Ruakura	131	64.5	+1.2	81.8	40.0	1.75	7	—1.4	0.51	22	177
Whakarewarewa ..	1,006	63.0	+0.6	79.2	43.9	1.27	9	—2.8	0.37	4	157
Gisborne	14	65.8	+0.7	82.8	45.0	0.69	6	—2.5	0.36	23	225
New Plymouth ..	160	63.8	+1.3	75.6	46.6	4.59	9	+0.5	1.52	15	172
Karioi	2,125	58.8	+1.2	78.9	36.8	2.22	6	—1.8	1.05	23	—
Napier	5	65.8	+0.4	83.2	48.1	1.92	7	—0.9	1.05	4	207
Wanganui	72	64.1	+0.4	82.5	47.2	2.35	11	—0.6	1.31	4	197
Palmerston North ..	110	64.6	+2.1	82.1	40.8	2.10	11	—0.9	0.90	4	187
Waingawa	340	62.1	—0.3	85.5	39.0	1.82	7	—0.9	0.91	3	230
Wellington	415	62.6	+1.3	80.2	47.3	2.67	8	—0.9	1.10	3	218
Nelson airfield ..	5	63.3	+2.1	78.2	45.8	1.94	6	—0.4	0.78	3	226
Blenheim	14	65.0	+2.2	85.0	44.0	1.25	5	—0.7	0.57	15	279
Hanmer Forest ..	1,270	60.2	+0.8	85.5	40.0	3.98	9	+0.3	1.23	3	233
Hokitika South ..	15	60.1	+2.0	72.0	42.8	8.10	15	—0.5	1.59	11	143
Christchurch ..	22	62.8	+2.0	87.0	43.2	1.92	9	+0.1	0.56	11	208
Ashburton	323	62.8	+1.8	91.2	41.0	3.94	9	+1.3	1.20	11	184
Timaru	56	60.8	+0.6	89.2	38.8	3.16	13	+0.7	1.02	11	175
Alexandra	520	62.0	+0.6	89.0	36.0	2.53	7	+1.1	1.43	27	164
Taieri	80	57.0	—0.7	88.6	35.4	2.84	15	+0.3	1.19	2	147
Invercargill airfield ..	0	55.9	—0.3	79.6	35.0	4.39	19	+0.6	0.76	12	130
Chatham Island ..	150	58.1	—0.3	69.8	43.8	2.17	11	—0.2	1.14	4	—

Good varieties for setting out in May include Imperial 615 (Neapolitan Winter), Imperial D, Imperial 101, and Triumph.

Potatoes

Potatoes are liable to injury from pests and diseases, particularly in wet or poorly drained soils, and crops should be dug as soon as they are mature. Only tubers that are clean and free from injury and diseases should be put in store. Clean, healthy tubers store well in bags, bins, or boxes in cool conditions, but must be placed where light will not green the tubers. Air circulation should be good.

Spinach

Spinach thrives in cool conditions on a great range of moist, fertile, well cultivated and well drained soils. As it is not tolerant of high soil acidity, lime should be applied to most soils that have not been recently dressed, though too much lime may cause yellowing of the leaves and a deficiency or unbalance of certain essential elements, such as manganese or iron.

Spinach is hardy when established under cool conditions and can be sown throughout winter in well drained and well cultivated soil that is not too heavy, if the seedlings establish themselves without being lifted by heavy frosts. A good dressing of organic matter such as well rotted farmyard manure or compost is advisable on most garden soils, and as spinach is a leafy vegetable extra applications of nitrogen may be given by liquid manure or a side dressing of nitrate of soda or sulphate of ammonia raked in along the line of a row, but it should not touch the foliage.

Seed should be sown thinly, ½ in. deep in rows 12 in. apart. Plants can be thinned to four or five to 1 ft of row, though if seed is sown thinly, thinning can be confined to the removal of the young plants when large enough for use.

Varieties of spinach are available with either smooth or savoyed (crumpled) leaves, but spinach is usually sold as prickly seeded or round seeded. Prickly seeded spinach is usually sold for winter use, but choice of spinach to suit a particular season should be governed by variety rather than whether it is prickly seeded or round seeded.

Spring Cabbage and Cauliflower

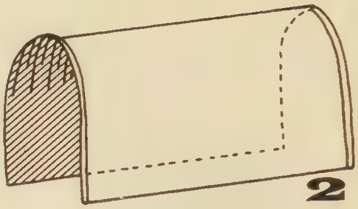
Cauliflowers and cabbages have similar needs, but cauliflowers are more sensitive to adverse conditions. If checked, cauliflowers are likely to

(Continued at the bottom of page 366)

Automatic Drinker for Temporary Water Supply to Intensively Housed Poultry

By S. G. HADDON,
Poultry Instructor, Department of Agriculture, Auckland

POULTRY farmers who have to give water-based drugs to intensively housed stock in sheds fitted with automatic (float-controlled) drinking systems may be interested in the way a Manurewa farmer has solved the problem.



THE existing drinkers are emptied and temporarily closed off. A circular drinker made from the base of a 40 lb carbide (or similar) drum fitted with a small float valve is placed conveniently on the floor. This is supplied through a polythene pipe joined to a 5- to 10-gallon tank on a temporary stand outside the shed. The tank's height on a stand gives sufficient head to control the float valve; its position makes for easy servicing and it can be large enough to hold a day's supply for the birds in the shed.

The polythene pipe is passed through the wire netting front or any other convenient opening. The float valve is protected by a metal guard, which also helps to hold the pipe connection in place. The drinker base in use was some 20 in. in diameter, giving a length of drinking space of some 5 ft. The dimensions of this portable drinker can be varied to suit the materials available; it is better for it to be on the large rather than the small side, and a guard of some sort must be fitted over the float valve to prevent flooding.

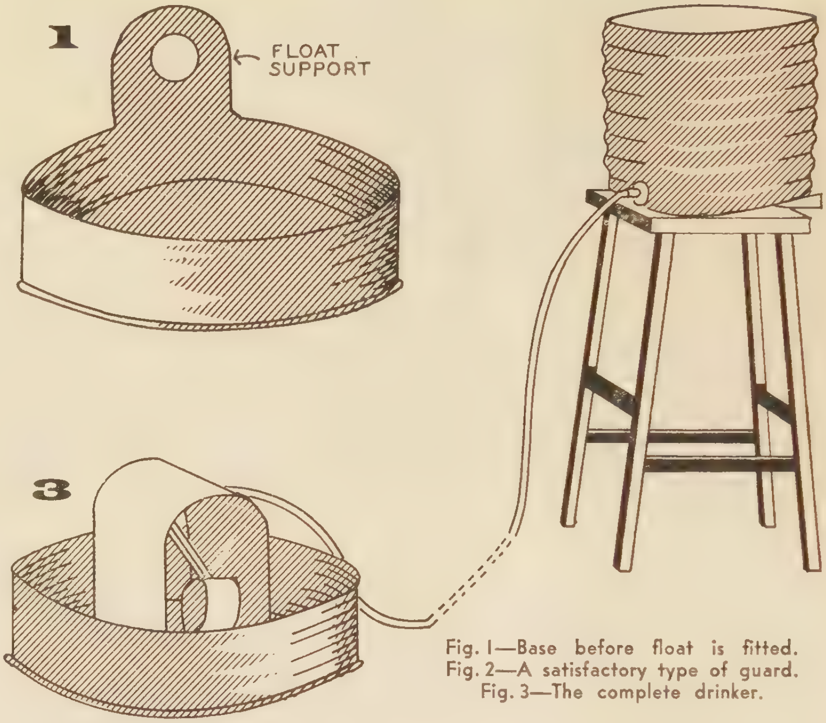


Fig. 1—Base before float is fitted.
Fig. 2—A satisfactory type of guard.
Fig. 3—The complete drinker.

Work in Home Garden

(Continued from page 365)

form only miniature heads, and frost damages curds and may permit the entry of soft rotting organisms. Cauliflowers for spring use should, therefore, be planted out only in districts and situations where winters are not very severe. In unfavourable situations planting is often deferred until July, August, or even September.

Spring cabbage can be set out from early autumn until late winter, depending on climate, variety, and the need for a succession. If large plants are set out too early, they may make soft growth and be severely checked or even forced into premature seed development by a prolonged period of low temperature.

The soil for spring cabbage and cauliflower should preferably be rich in organic matter. In most home garden soils a dressing of organic matter such as farmyard manure, stable manure, compost, or a moderate dressing of fowl manure is likely to be beneficial. If the soil has not been limed recently and there is a risk of its being acid, a dressing of 3 to 4 oz of carbonate lime per square yard is advisable.

Though cabbages need fairly heavy dressings of manure, great care should be taken to distribute it evenly, as young plants may be checked if the roots come in contact with too heavy concentrations, particularly when low temperatures limit growth. Where organic manures are not available a green crop should be dug in. Except where the soil is very rich the organic manure or green crop should be supplemented by a complete fertiliser at 2 to 5 oz per square yard.

In addition side dressings of nitrogenous fertilisers such as nitrate of soda or sulphate of ammonia are often advisable, particularly where organic matter applied to the soil is strawy, rather than sappy and well rotted, and when forced growth is needed as temperatures rise in early spring.

Varieties

There are many good varieties of pointed or spring-type cabbage, but Flower of Spring is probably the best for the greatest range of conditions. Triumph has also given good results in many districts.

Hardy varieties of cauliflower suitable for planting now include All Seasons, All Year Round, and Early London.

Senior Staff Changes in Department

Retirement of Assistant Director of Dairy Division

AFTER almost 50 years' association with the dairy industry, during which he has been dairy factory worker, dairy factory manager, dairy farmer, and for 33 years an officer of the Department of Agriculture, Mr M. H. Wallace, Assistant Director of the Dairy Division, retired on 3 April. He is an authority on the manufacture of starter butter, a type with lactic flavour.

Mr Wallace.

Mr Wallace began dairy factory work on the West Coast of the South Island in 1912. In the 1914-15 season he was with the Cardiff cheese factory in Taranaki, but he returned to the West Coast to become secretary-manager of the Kumara Dairy Company. He left this company after four years to take up dairy farming, but in 1922 resumed factory management, at Arahura, where he remained until joining the Department of Agriculture in 1928.

Mr Wallace was Dairy Instructor and Grader successively at Wellington (1928 and 1930-36), Castlecliff (1929-30), Palmerston North (1936-37), Hamilton (1937-38), and Whangarei (1938-46). He became Assistant Inspector of Dairy Products, London, in July 1946 and was promoted to Inspector in 1950. He returned to New Zealand in 1955 to take up the position of Assistant Director of the Dairy Division.

New Assistant Director of Dairy Division

MR N. E. BRIGGS, Superintendent of Grading, has been appointed Assistant Director of the Dairy Division of the Department of Agriculture in succession to Mr M. H. Wallace, who retired on 3 April

Mr Briggs joined the Department in 1948 as Dairy Instructor and Grader at Wellington. He was transferred to Hamilton in 1952 and Palmerston North in 1953. He was appointed Superintendent of Grading in November 1959.

Before joining the Department of Agriculture Mr Briggs had had 19 years' experience in cheese, butter, and casein factories, including 10 years as a factory manager.

Three years ago Mr Briggs visited the United States to study new processes and techniques in the use of dairy by-products.

Mr Briggs.

Mr S. Swift Retires

ONE of the Department of Agriculture's most widely known administrative officers, Mr S. Swift, Divisional Executive Officer of the Animal Industry Division, retired after 40 years' service on 3 April. He was closely associated with the implementation of the "killer policy" by rabbit boards which led to such spectacular reduction of rabbits.

Mr Swift also helped to launch the scheme for Tb testing of town milk supply herds and was secretary of the commission of inquiry into Tb testing. Later he assisted with the drafting and introduction of the scheme for voluntary testing of factory supply herds.

Mr Swift.

Mr Swift was secretary of the Stock Remedies Board from its inception in 1935 until 1940. He also took a prominent part in the campaign for the eradication of hydatids which led first to the formation of the National Hydatids Committee, of which he was secretary, and later of the National Hydatids Council. He was secretary of the latter until its own administrative staff were appointed.

Joining the Department of Agriculture as a cadet in Wellington in 1921, Mr Swift was transferred to Ruakura in 1928 and to Palmerston North in 1932. He returned to Wellington in 1934 and, apart from two years with the National Service Department during the war, remained at the Department's head office. He became Divisional Executive Officer in 1944.

Dieldrin and Aldrin Resistance in the Green Blowfly

By DAPHNE V. HART,
formerly Scientific Officer, Department of Agriculture Animal Research Station, Wallaceville

FOR several years dieldrin and aldrin have been widely used in New Zealand for the control of keds, lice, and blowflies on sheep. These modern insecticides are extremely lethal to insects and, in addition, because of their outstanding persistence in the fleece, they remain active many weeks after application. A further advantage is their ability to spread through the fleece, so that complete saturation has not been necessary and good control has followed surface application as a tip spray or as a dust.

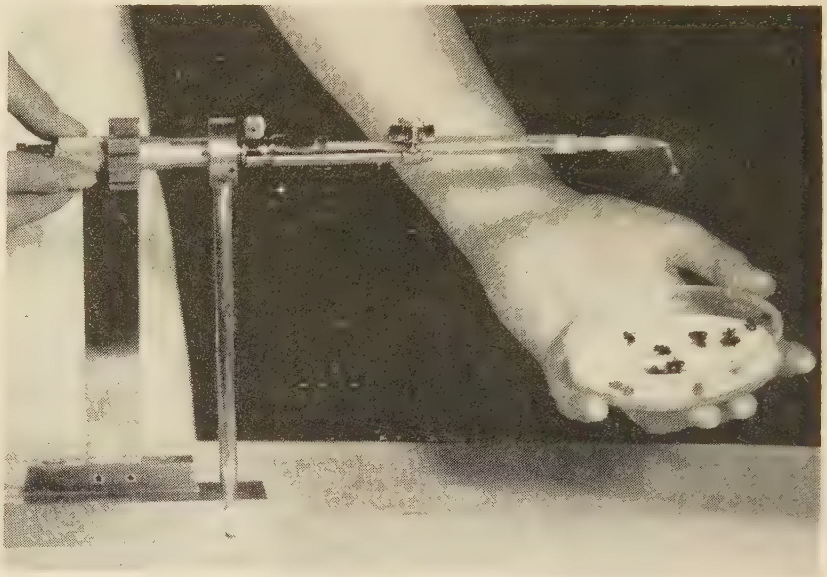
OVER the past two seasons, however, the green blowfly has developed resistance to dieldrin and aldrin, particularly in Marlborough, Nelson, Hawke's Bay, and Poverty Bay. Several years ago Australia and South Africa had a similar experience with *Lucilia cuprina*, a close relative of the New Zealand fly *Lucilia sericata*. In those countries resistance became widespread in a short time and the use of alternative insecticides became essential to control fly strike.

Comparisons of Susceptibility to Dieldrin

In experimental work at Wallaceville comparisons have been made of the susceptibility of several strains of flies to dieldrin. The methods used involved applying measured drops of various strengths of insecticide to the bodies of adult flies and noting the mortality rate after 24 hours.

It has been shown that the dose of dieldrin required to kill the most resistant strain is about 400 times the dose required to kill normal susceptible flies.

All resistant strains so far tested have proved to be fully susceptible to diazinon. The use of an organophosphorus insecticide, such as diazinon, "Delnav", or nankor, is therefore indicated where dieldrin and aldrin resistance is present or suspected.



Application of measured drops of insecticide solution to anaesthetised adult flies.

➘ Resistance is measured from the mortality rates of flies treated with various strengths of insecticide.

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·01%
·025%
·05%
·1%

Studies in Farm Management

A PIAKO DAIRY FARM

▼ On the Piako farm discussed in this article barberry hedges are planted down most fencelines and a belt of *Cryptomeria japonica* and gums gives good shelter to the homestead and neighbouring paddocks.

CLEARING and stumping swamp areas, draining, and sound management have been the key to raising butterfat production from 16,300 lb in 1948-49 to 34,200 lb in 1959-60 on the 101-acre Piako dairy farm of Mr T. A. Middleton. Development of the property is traced in this article by S. D. Clay, formerly Farm Advisory Officer, Department of Agriculture, Morrinsville.

THE good standard of production achieved on the farm was obtained by concentrating on growing a large amount of grass and on carrying as many cows as possible, yet another confirmation that good feeding is most important when a high level of dairy production per acre is the aim.

Situation

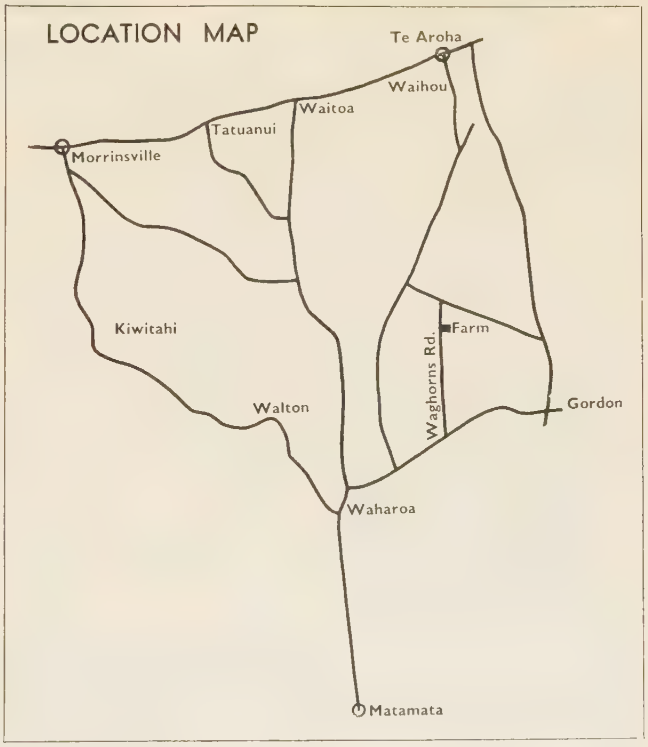
Mr Middleton's farm is 12 miles from Matamata in the Manawaru district of Piako County.

Soils

The 101-acre property is divided almost equally on two different soil types—a yellow-brown loam (Waihou sandy loam) and a meadow soil (Waitoa silt and sandy loam). A terrace half-way down the farm divides the two types.

Yellow-brown Loam Soil

The Waihou sandy loam is about 15 ft higher than the meadow soil at the front and the farm house and



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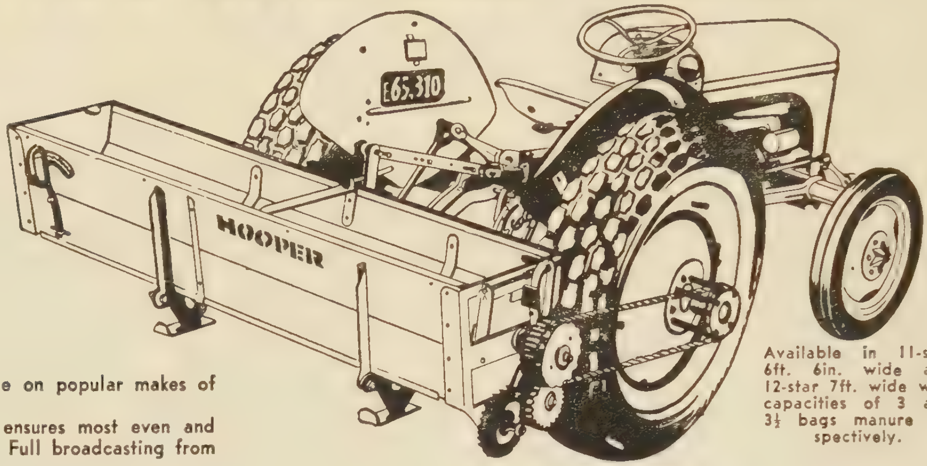

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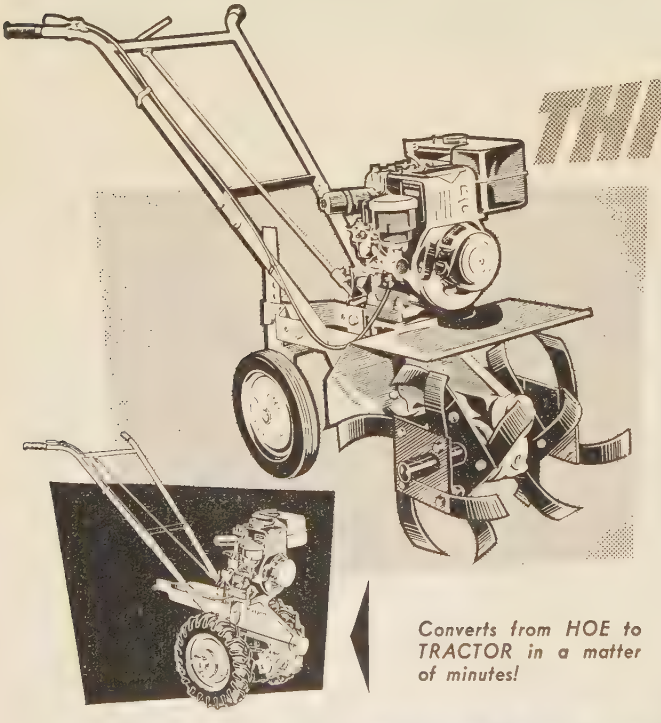

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buildings are on this terrace. Waihou sandy loam is one of the group of yellow-brown loams. These soils are derived from fine-textured volcanic ash. The soils are generally easily worked and grow good crops, but they need regular and adequate applications of fertiliser to grow good pasture. They are very phosphate responsive and have the ability to lock up phosphate in an unavailable form.

After being farmed for a number of years these soils become increasingly responsive to potash and are also mildly lime responsive.

Most of these soils are free draining and quick growing in spring, and Waihou sandy loam conforms very well to this pattern. The topography of the yellow-brown loams varies from flat or gently undulating such as Waihou sandy loam to moderately steep as are many of the soils in this group.

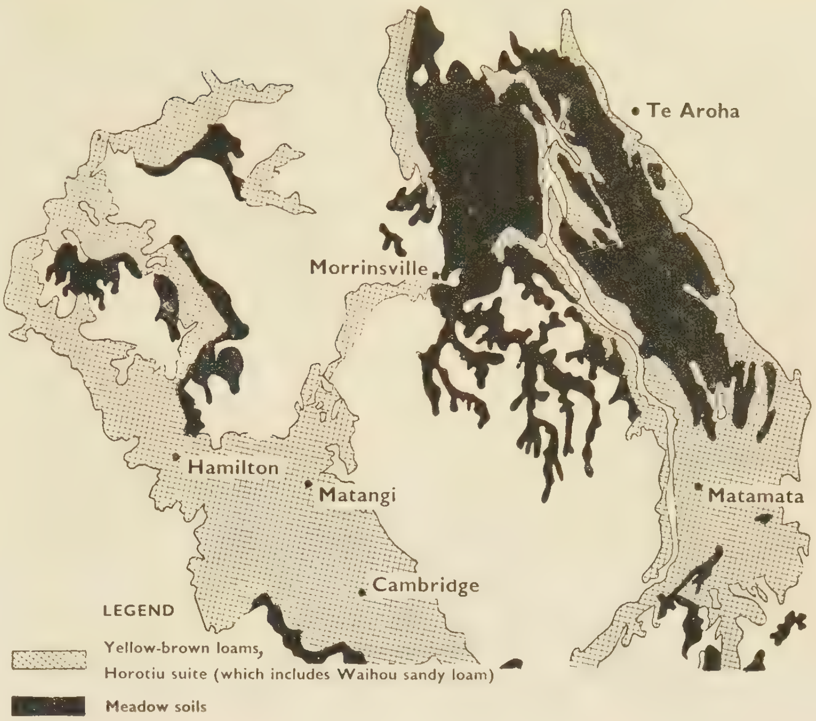
Few problems associated with farming yellow-brown loams are difficult to overcome apart from their tendency to dry out in summer. Waihou sandy loam under intensive dairying seems to require at least 3 cwt of superphosphate a year to maintain an adequate phosphate level. After being farmed for 20 to 30 years most farms on this soil begin to be potash deficient. Initially, applications of 1 cwt of muriate of potash per year maintained vigorous pasture growth, but during the last few years there have been indications that rates of potash between 1½ and 2 cwt may be necessary on some high-producing farms.

Meadow Soils

All meadow soils require drainage and undrained tend to have ground water at or near the surface for much of the year. These areas of flat soils are confined almost entirely to the Auckland Province, the largest area being in the Hauraki Depression, which runs from Thames south to Waitoa, Te Aroha, and almost to Matamata.

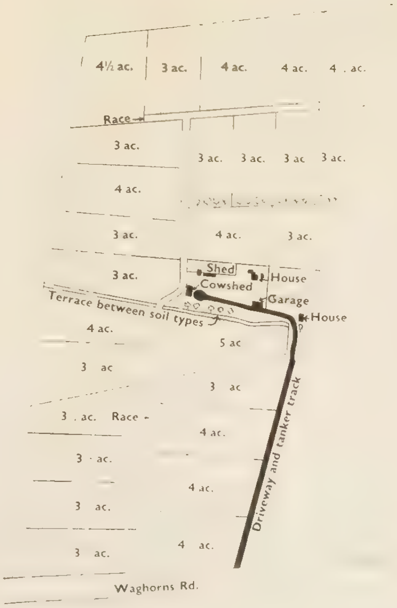
When the first settlers came to the district about 1901 and for many years after large areas of these meadow soils were very wet swamps. Much of the land had to be rowed across rather than walked on.

Poor drainage was and still is by far the largest problem. Because most of these soils are very flat and low lying, it is often difficult to find a suitable outlet for water, and many drainage schemes failed when it was found after the drains had been dug that the water would not run in the direction intended. The subsoils are very impervious, and this has meant that once the ground water level has been lowered by an adequate number of open drains it is still difficult to get rid of surface water rapidly unless the land is graded to provide some surface drainage to collect the water and run it off into the nearby open drains.



▲ Simplified soil map showing meadow soils and those yellow-brown loams which are most closely related to Waihou sandy loam.

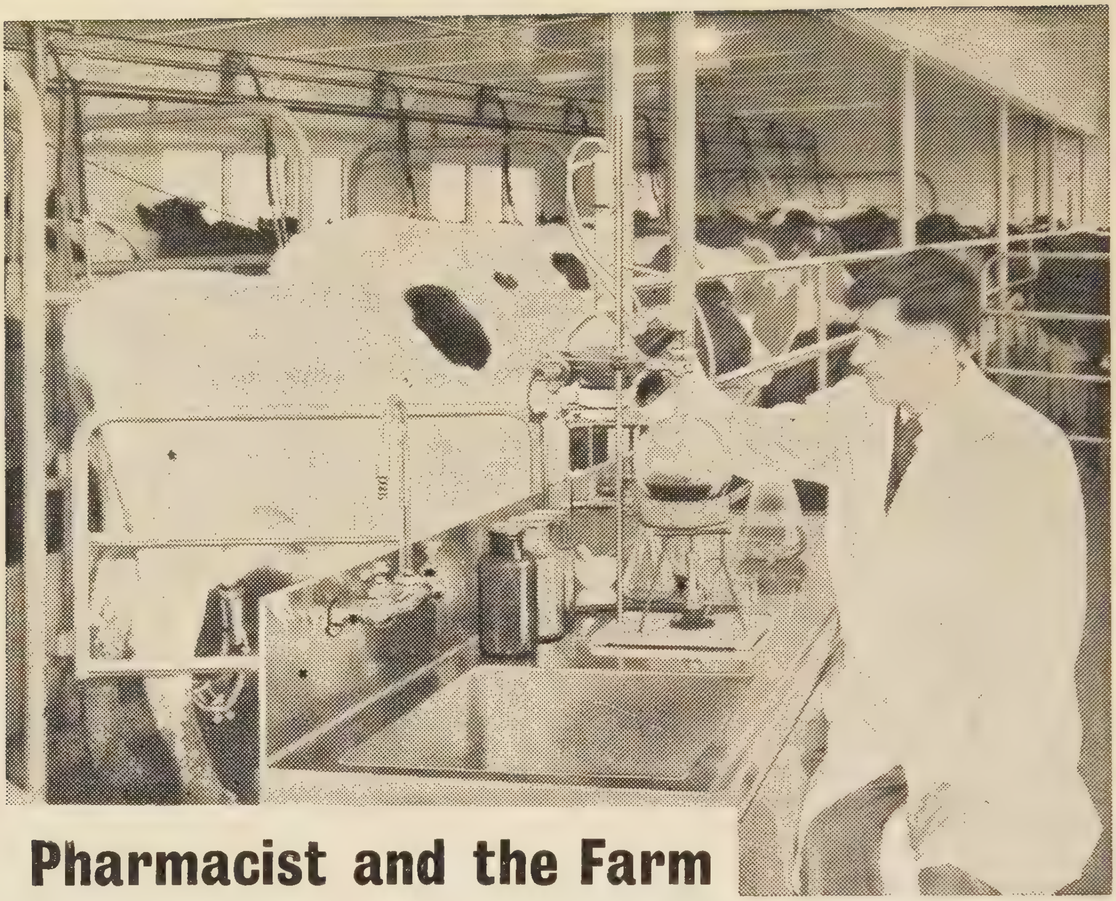
▼ Farm plan.



The subsoil on Mr Middleton's farm seems to be a little more sandy and a little more pervious than is typical of the soils in this group, and he has been able to get very efficient drainage by laying a large number of field tiles. On most of the soils in this district field tiles do not work well, as the subsoils are so impervious that water will not move laterally through the soil to the tile drains. Waitoa silt and sandy loam requires much the same quantity of phosphate as Waihou sandy loam, but needs less potash and slightly more lime.

Climate

On Mr Middleton's farm annual rainfall is about 45 to 50 in. Most of this is fairly well distributed throughout the year, but there is usually a dry period during January, February, and sometimes early March, when the freer draining Waihou sandy loam tends to dry out quite badly. Winters are cool, with about 30 frosts a year, the most severe of which reach 12 or 15 degrees. Normally, May and June are quite pleasant months, but in July and August heavy rains are common and there is much bleak, cold weather.



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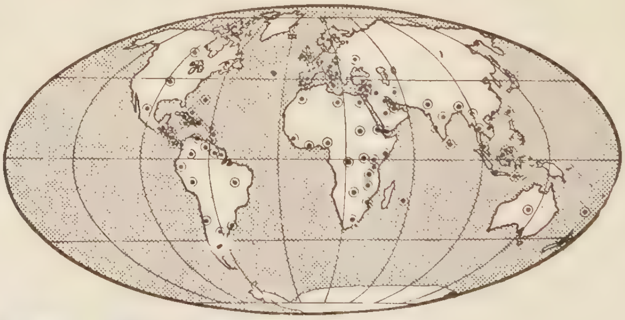

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Mr Middleton took over his farm in 1947. It was half of a block taken over for settlement of servicemen and divided between Mr Middleton and another returned serviceman. For the first year the two farms were run as one unit, as there were only one house and one cowshed between the two properties. For this first year Mr Middleton's neighbour grazed a herd of 70 yearling heifers and Mr Middleton milked his 62 heifers in the original cowshed. While the two farms were run as a unit Mr Middleton erected a house and cowshed on his 100 acres.

When the farm was taken over it looked anything but an attractive proposition, and had been turned down by a number of other returned servicemen who considered that it would be too difficult. Fifty-six acres of the farm were cleared but were in very poor pasture, the remaining 45 acres being swamp covered in rushes and blackberry and full of rimu, white pine, and matai stumps, and the whole area was devoid of shelter other than blackberry.

Labour

For the first four years Mr Middleton milked the herd and did all the farm work himself, but for the next seven years he had a man to help him, and in 1959-60 a married couple has been employed.

Development

In the first year most of Mr Middleton's spare time was spent in erecting his cowshed, helping with his new house, and trying to straighten up some of the dilapidated fences.

In the second year he began to tackle the swamp, clearing and stumping an area preparatory to cropping it the following season.

In 1949-50 season 7 acres that had been cleared was ploughed and put into a winter crop of swedes. This crop was most unsuccessful, as the ground, not yet properly drained, was far too wet during winter. Further drains were dug, and the area was put into a summer crop of chou moellier and grassed down the next autumn. Each year after this a further section of the swamp was stumped, cleared, and drained and put into a summer crop at about 7 acres for the first three or four years, but afterwards decreased to 4 or 5 acres a year.

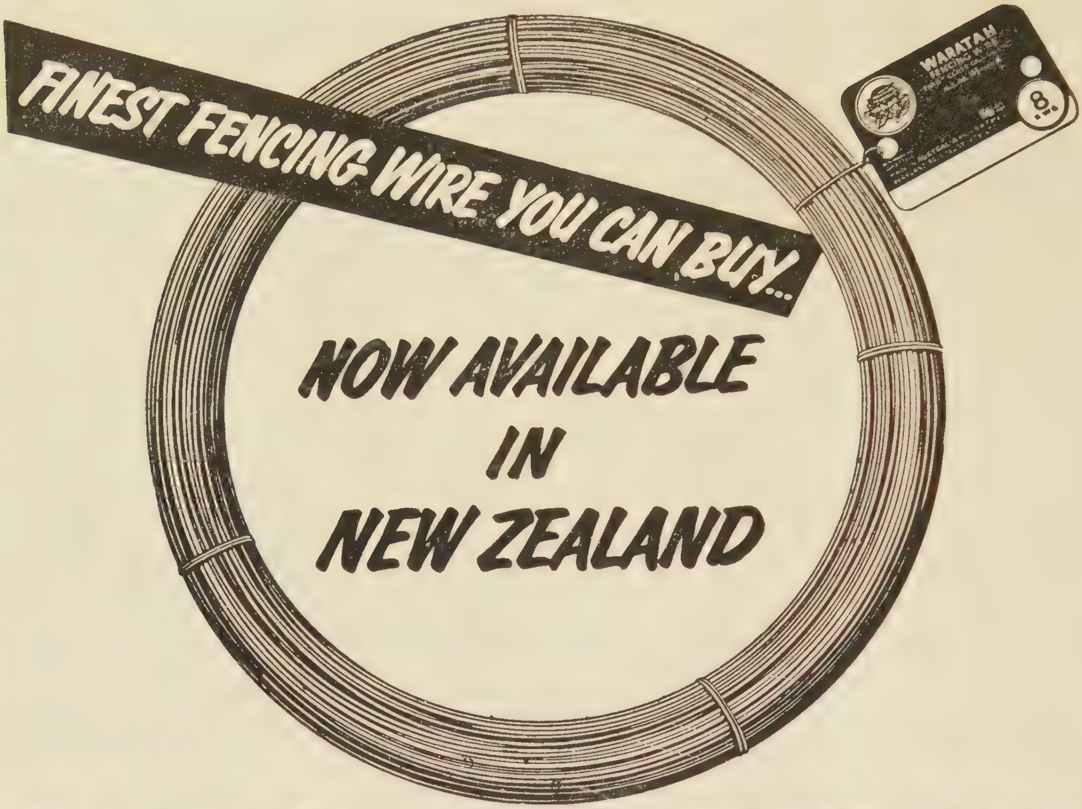
Each year as well a part of the swamp was cleared of blackberry and most of the rushes and oversown with a mixture of perennial ryegrass and white clover at about 17 lb of seed per acre.

By 1952 the swamp had all been cleared and partially drained and sown down in permanent pasture or oversown. It was not until 1957 that all the bottom flats had been ploughed and regrassed.

The pasture mixture which was used almost unchanged during the development of the farm was 10 lb of short-rotation ryegrass, 23 lb of perennial ryegrass, 2 lb of timothy, 3 lb of red clover, and 1 lb of white clover. In addition to the major programme of developing the bottom flats, pastures on the top flats every year or so were given a thorough discing and oversown with perennial ryegrass and white clover. With fertility very low at first, it was a battle to prevent paspalum from taking charge of all the pastures, and the regular discings up and oversowing helped considerably to prevent the paspalum from becoming root-bound.

Now that fertility has been raised to a high level there is no problem of pastures becoming paspalum dominant; in fact there is little paspalum on the farm, even in the wetter bottom flat paddocks.

On the bottom flats about 8,000 tiles were laid in conjunction with the addi-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tional open drains. After ploughing and regrassing of the bottom flats were completed Mr Middleton continued to crop a small area of the top flats each year. The pastures on the top flats had improved beyond recognition over the years with the manuring and oversowing programme, so the ploughing and cropping have been done mainly for the sake of levelling the paddocks and partly because Mr Middleton likes to have an area of white-fleshed turnips to help feed his herd better through the dry summer spell.

Topdressing

As can be seen from the rapid clearing and regrassing programme the owner's aim was to get as much of his farm into first-class pasture as soon as possible, so all new pastures were liberally treated with fertiliser. Each young grass paddock was given a dressing of 2½ to 3 cwt of serpentine superphosphate in both spring and autumn. The rougher bottom flats which had still to be properly drained and regrassed received only one dressing of 2½ to 3 cwt of serpentine superphosphate a year.

It was not until the 1950-51 season that Mr Middleton first started using potash. In that season all the paddocks which had been regrassed were given a dressing of 1 cwt of potash. Subsequently Mr Middleton bought 2 tons of potash a year, and only the paddocks which appeared to need a bit of a boost got a dressing of 1 cwt per acre.

The whole farm was topdressed with phosphate every autumn to boost grass growth during winter, and those paddocks which appeared to need a little extra were given another dressing of phosphate in spring along with the silage paddocks which were topdressed after being cut. New grass pastures have always had preferential treatment in spring also.

Since he has had the farm Mr Middleton has given the bottom flats several dressings of copperised superphosphate. Mr Middleton has had no real trouble with stock due to copper shortage, but applies copper occasionally as a precaution, because cases of copper deficiency on meadow soils throughout the district are becoming more frequent every year.

For the first few years Mr Middleton used to apply between 15 and 20 tons of lime per year at ½ ton per acre. More recently, he has been applying 10 tons a year, and this lower amount is justified by evidence from soil tests and fertiliser trials which have been carried out on the property.

Grazing Management

Mr Middleton attributes much of his success in obtaining a high production level, and rightly so, to his pasture and herd management in autumn-winter and early spring.

During the first years he managed the farm Mr Middleton fed out hay and silage early in winter and toward and after calving break grazed between 30 and 40 acres of autumn-saved pasture.

During the last two seasons he has changed to wintering mainly on pasture. Early in April the rate of movement of the herd is slowed up; the cows spend two days and nights in a 4-acre paddock with plenty of silage. This procedure is continued until the end of May when the herd is dried off, and by this time there has been a large build-up of grass ahead of the herd.

When the herd is dry all the cows are concentrated in one paddock which is poorer in fertility than the rest, large amounts of hay and silage are fed out, and the paddock dunged up for about three weeks. In particularly wet weather the herd may be split between two paddocks to prevent excessive pugging. This dunging up treatment is given mainly to the top flats, which are both drier and stand up to the treatment better and are more in need of improvement than the young grass paddocks on the bottom flat area.

Toward the end of June the early calvers are sorted out from the rest of the herd and put in a separate paddock, where they are given preferential feeding. They are given extra grass and hay until they are within 10 days of calving and then the rate of feeding is reduced slightly, as Mr Middleton has found that if he continues feeding at a high level right up to calving, he is more likely to get calving troubles, milk fever, and other metabolic disorders. After calving the herd is fed a good ration of grass plus hay.

The system is of course extremely flexible, as weather can call for rapid changes in procedure from day to day, but all the time the farmer is planning well ahead and making sure that he is not allowing the herd too large an area of grass and that the rate of recovery of the pastures is going to be sufficiently rapid to ensure that he will not run out of grass before the spring growth really begins.

In this way Mr Middleton ensures that there will be no period where the

▼ The low-lying flats in the front of the farm with the Kaimai Range in the background.

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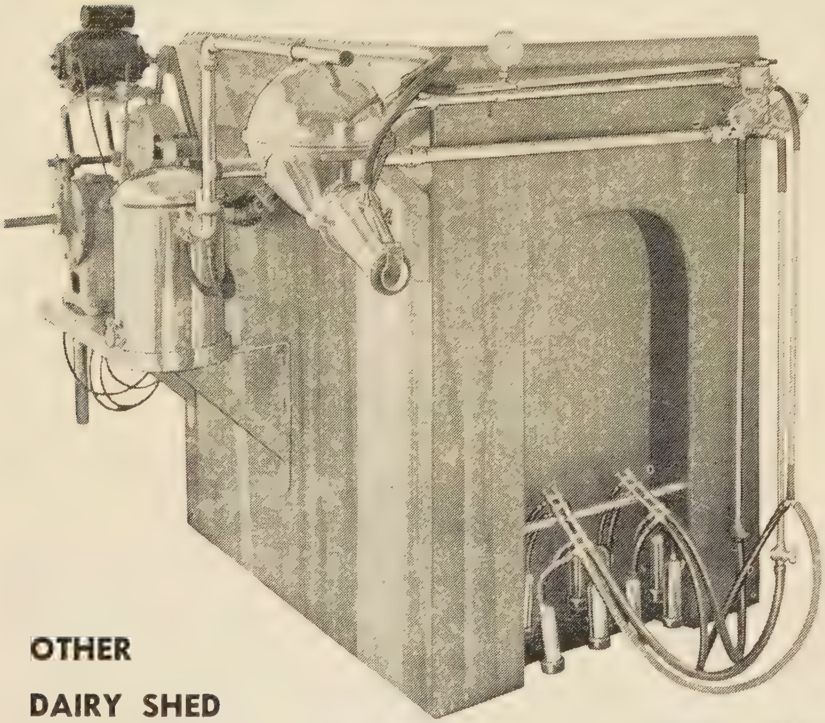

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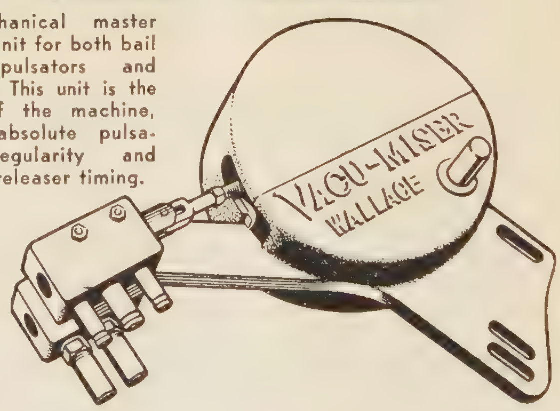

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herd will not be getting an adequate ration of grass. This overcomes the likelihood of a shortage in September and the need to graze pastures bare just before the spring flush of growth begins. This means that the feed available to the herd during the early spring is all fairly uniform and there is not the sudden change from long, rank, autumn-saved pasture to short, very lush spring grass as occurs on many less well managed farms.

Hay and Silage

To provide adequate supplementary feed for this wintering programme Mr Middleton likes to save 20 to 25 acres of silage and 10 to 12 acres of hay each year. From time to time when growth during spring has not been quite as good as usual he has had to buy in hay to make up the 1,200 bales which he likes to have on hand before the start of each winter. When buying his hay Mr Middleton always goes to visit the paddock before it is cut to see that not too many weeds are present.

Subdivision

When Mr Middleton first took over the farm it was poorly subdivided, the bottom and the top flats being divided into four paddocks. All of these original fences were very dilapidated, so he had virtually to start from scratch. Six months after he bought the farm a dragline went through and deepened the main drain, the spoil being used for building up a race across the bottom flats during his second season. The race was fenced off along the top flats, following the existing fencelines, and all future subdivision was planned from this system of races.

For the first few years all subdivision was done with single-wire electric fences operated from the shed by an overhead wiring system. Even the race was fenced off with electric wires. Each year since then Mr Middleton has put in more permanent fences and planted barberry hedges along most fencelines.

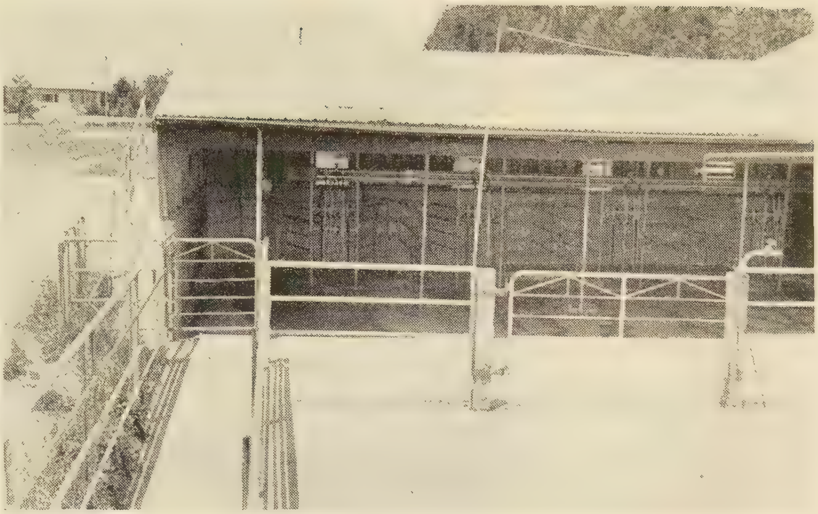
In addition to the barberries there are three high shelter belts of *Cryptomeria japonica, Cupressus benthami*, and gums.

Buildings

Since the house and cowshed were built there have been few changes in the farm buildings. The implement shed was built within a short time of Mr Middleton's taking over the farm, and more recently a hay barn has been built. Two years ago the original house was added to and this last season a cottage was built for a married man.

Stock

For the first three seasons after taking on his herd of heifers Mr Middleton reared calves for his own herd replacements. When heifers of his own breeding entered the herd during the third and fourth seasons after he began farming the property, their poor quality led him to discontinue saving his own replacement stock.



Keynotes of the milking shed on Mr Middleton's property are efficiency of operation and hygiene.

Since then he has reared about 18 calves each year, but sold them in March or April. For his herd replacements he has made a yearly trip to Taranaki to buy heifers. Each year he has bought the heifers from the same grazier, who in turn bought in his stock in small lots from neighbouring farmers. It can be seen that the stock which Mr Middleton was buying could only have been average, as they were discards from other herds.

Such good production from animals of only ordinary quality can be accounted for only by good management and particularly good feeding.

Season		Cows milked	Fat per cow lb	Fat at factory lb	Fat per acre lb
1948-49	..	64	256	16,336	162
1949-50	..	68	252	17,101	169
1950-51	..	70	293	20,535	198
1951-52	..	74	292	21,677	214
1952-53	..	78	320	24,977	247
1953-54	..	80	296	23,739	235
1954-55	..	85	286	24,275	240
1955-56	..	90	309	27,864	276
1956-57	..	92	309	28,450	282
1957-58	..	98	314	30,575	302
1958-59	..	99	349	34,605	343
1959-60	..	98	349	34,200	338

Despite a slight setback in the 1959-60 season, there is every reason to expect that production will go still higher. For this 1960-61 season Mr Middleton is milking 105 cows and, despite poor growing conditions in early spring, had more feed at this time than most other farms in the district and he seems to have every prospect of another highly productive year.

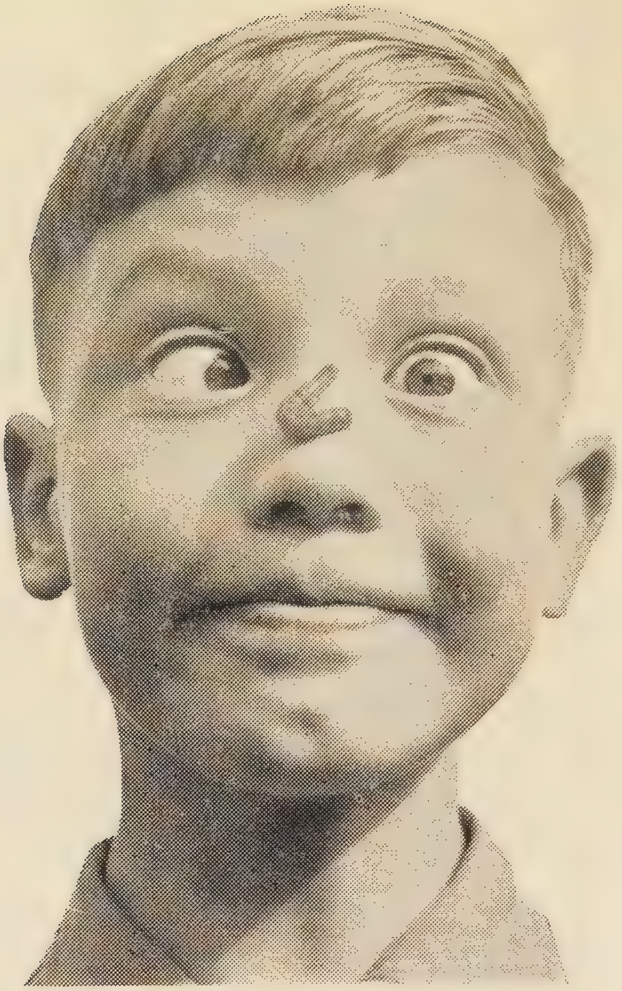
Mr Middleton has lost only four cows during the 11 years he has been on the farm. Since he first took over the farm he has had little trouble with disease, and part of the reason for this is that he has never bought mature cows. Even bloat which commonly afflicts high-producing farms has been of little consequence. Last season Mr Middleton had his herd Tb tested, and had only 2 per cent of reactors.

A high level of feeding throughout the year, intelligent management, and a careful routine in the cowshed have kept the stock in the pink of condition, practically untroubled by disease and nutritional upsets. At no stage has Mr Middleton herd tested and culling has been mainly confined to the empty cows and obvious low producers.

The table on this page shows that the stocking rate has increased year by year and that the production increased along with it.

In future Mr Middleton intends to breed his own replacements, as he can see that it is going to be extremely difficult for him to increase his production further unless he improves the quality of his herd.

In the 1959-60 season most of his herd was serviced by a.b., and there is every indication that Mr Middleton will be able to carry his replacement stock on the farm for most if not all the season in addition to the cows he is now milking. There seems little doubt that Mr Middleton will be able to carry his extra stock, and as the quality of the herd improves production could go still further.



One makes a pet!

The depredations of one caterpillar are nothing much, but caterpillars rarely come in ones. *Multiply by x . . .* and then, almost overnight, a cabbage crop can be eaten to the ribs, or a forest of young conifers become a desert of standing sticks. The only really effective answer is to strike back hard with insecticides.

This is what growers are now doing with a new systemic insecticide called 'Phosdrin', developed by Shell specifically for the quicker, cheaper control of caterpillars and aphids. 'Phosdrin' virtually wipes out the heaviest infestations within a a few hours of spraying. Yet it decomposes quickly, so that the sprayed crops may be gathered safely within a short period of time.

Constant research and new product development has made Shell the world's largest supplier of agricultural chemicals. 'Phosdrin' is the latest addition to Shell's range of proven protective chemicals.

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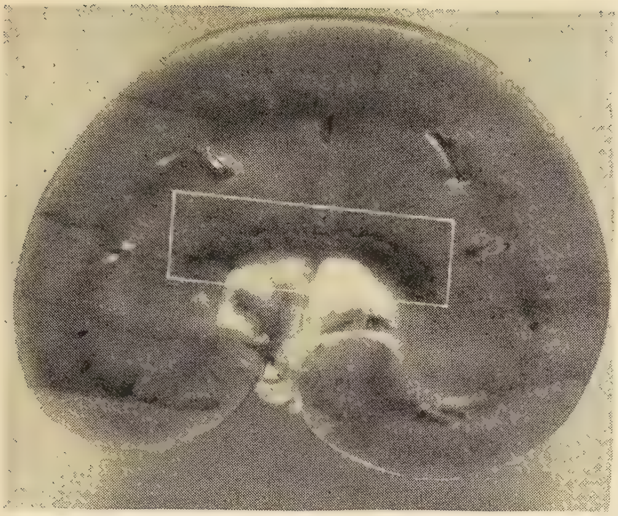

ROUND THE RESEARCH STATIONS

Current Work and Findings in Department of Agriculture Trials and Experiments

Wallaceville

Phenothiazine Poisoning in Lambs

During the last five years several mortalities in lambs have been reported after the use of phenothiazine at weaning. Deaths usually occur three to 10 days after drenching and the most striking finding at post-mortem examination is the kidney damage as shown in the section outlined in the illustration. Evidence suggests that many of these deaths are associated with dosing lambs when they are in a partially dehydrated state. When the weather is such that dehydration could occur it is unlikely that parasites would be present in large numbers, and drenching should be delayed. The practice of weaning, crutching, dipping, and drenching at the same yarding imposes very severe stress on a young lamb and is condemned.

Phenothiazine is not only a very efficient anthelmintic but has been comparatively free of toxic effects since its introduction. It can still be used with safety, but should be reserved for the drenching of lambs in early autumn, when it is likely to be more effective and perfectly safe.

Experiments are being continued at Wallaceville to determine under what conditions this toxic effect is produced.

Ruakura

Electronics and Agricultural Research

Many factors in both plant and animal growth and development require specialised techniques for measurement. Electronics can play a large and valuable part in achieving more accurate results and an electrical engineer recently joined the staff at Ruakura Animal Research Station.

Two of the many projects already in hand in which electrical equipment is used are: Experiments involving the measurement of light penetration through pasture; studies in silage making.

Recent work has shown that the amount of light used by plant leaves during photosynthesis has an important influence on pasture production. To measure the percentage of surrounding light actually used by herbage, an electrical device involving the use of photo transistors and a light-recording unit has been designed. With this it is hoped to relate the amount of light used by the pasture to factors such as pasture production and seasonal growth rate.

In an attempt to gain data on the relationship between heat production and quality of silage, a special electrical unit has been devised which has thermistors and electronic control equipment which prevents heat loss or gain by the package of silage under test. Such control will enable the quality of silage made under different degrees of compaction to be more accurately related to heat production in the test package.

Wallaceville

Trace Elements in Animal Health

A number of trials with a variety of trace elements other than those known to be required in particular circumstances have so far failed to give weight responses in lambs. These trials are, however, continuing. Meanwhile the only trace elements of known value are copper, cobalt, iodine, and selenium. These should be used only where corresponding deficiencies occur.

Wallaceville

Effect of Molybdenum and Sulphate on Copper in Lambs

Topdressing paddocks grazed by pregnant ewes with molybdenum and sulphate will lower the copper content of the blood and livers of their lambs to levels consistent with copper deficiency. Preliminary observations at present being followed up suggest a deleterious effect on wool quality in the ewe.

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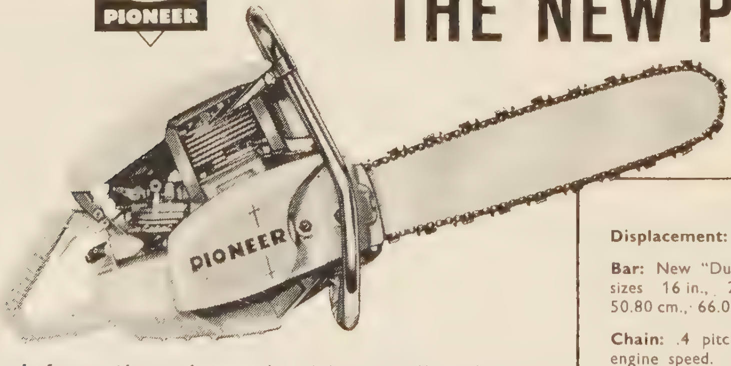

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Results from Three Years of

LINSEED VARIETY TRIALS

By J. H. CLARIDGE, Chief Advisory Officer (Agronomy), and K. COTTIER, Senior Scientific Officer, both of the Department of Agriculture, Wellington

TWO varieties of linseed, Redwood and Rocket, have been outstandingly the highest yielders in three years of trials up to and including the 1959-60 season. Golden Viking and a back-cross selection known as Golden Viking I have also generally given higher yields than the variety Marine. These varieties have been the main ones used in the trials; others less extensively tested have been Golden Viking II, Koto, and K5 and K25 (the two last named being selections from Koto).

FOR several years immediately before the season 1957-58 there was very little commercial linseed growing in New Zealand; and linseed variety trials had last been conducted by the Farm Advisory Division in 1953-54. With the resumption of extensive commercial sowings in 1957-58 linseed variety trials were recommenced. These have been continued in succeeding seasons, and results from the past three seasons are now available.

In 1957-58 the position with linseed varieties had changed considerably. Golden Viking, a variety which had earlier been widely grown, had fallen into some disfavour, but several promising varieties which had not previously been tested in the field were available for experimentation.

In the three years ending with the 1959-60 season, 13 linseed variety trials giving accurate information on yield results have been conducted. These have all been in linseed-growing districts of the South Island—two in North Canterbury, seven in Mid Canterbury, and four in South Canterbury. One trial was also sown in Southland, but no reliable yield data were obtained because of unfavourable conditions at harvesting.

Varieties

Varieties which have been included in trials are as follows:

Redwood: A variety of U.S.A. origin, which has been available commercially in New Zealand for only a short time. It has performed well in the present trials, and already nearly half the linseed acreage is of this variety.

Rocket: A Canadian variety introduced about the same time as Redwood which has also performed well in these trials and is second only to that variety in the acreage being grown commercially.

Arrangement of Trials

THE trials have been conducted by the Farm Advisory Division of the Department of Agriculture in cooperation with the Crop Research Division of the Department of Scientific and Industrial Research, Lincoln; and they have been sown on the properties of cooperating farmers in the linseed-growing areas of Canterbury.

Golden Viking: An American variety with light coloured seed with rather higher oil content than that of other varieties in the trials. This variety fell in popularity about 1954 because of its susceptibility to pasmo infection, a stem disease causing reduced seed yields. Though again grown more widely since, it has now been largely replaced by Redwood and Rocket.

Golden Viking I: This variety was bred at Crop Research Division, Department of Scientific and Industrial Research, Lincoln, by crossing Golden Viking with other lines of high rust resistance, then repeatedly back crossing to Golden Viking and selecting for rust resistance. This programme was designed to produce a linseed like Golden Viking, but with permanent resistance to rust. Seed is now becoming available commercially.

Golden Viking II: This variety was bred at Crop Research Division in the same way as Golden Viking I, but seed has not been released.

Marine: A variety of American origin which had replaced Golden Viking to some extent in 1958, but which in turn has been widely supplanted by Redwood and Rocket. It is the earliest maturing of the varieties tested.

Koto: An early maturing variety which has been grown on a small scale in past years.

K5 and K25: Two selections from Koto made by the Crop Research Division, Lincoln, on the basis of rust resistance.

Because of the existence of a number of strains of rust, only some of which may be present in a particular country or even locality, a variety may show rust resistance at one place and not at another. Also, as new strains of the rust fungus can develop, varieties at one time regarded as resistant may later show susceptibility. It is therefore not possible to state with certainty that a particular variety is rust resistant, though practically all the varieties mentioned have at some stage exhibited some resistance to rust.

Yields

The seed yields from the trials are shown in the table at the top of page 383. The yields of Marine are quoted in hundredweight per acre and the yields of other varieties as differences from Marine. The differences marked with an asterisk are significant differences and can be accepted as proven. Some differences, though quite large, were not consistent enough to be accepted as significant.

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SEED YIELDS FROM LINSEED VARIETY TRIALS

Locality	Year	Yield of Marine	Difference from yield of marine							
			Redwood	Rocket	Golden Viking	Golden Viking I	Golden Viking II	Koto	K5	K25
North Canterbury										
Loburn	1958-59	19.3	+1.8	+0.9	+0.4	+0.1	—1.3*		+0.5	+0.3
Loburn	1959-60	9.0	+2.2*	+2.4*	+1.0	+0.5		—0.2		
Mid Canterbury										
Riverside	1957-58	24.4	+4.0*	+2.0*					+2.1*	+0.3
Eiffelton	1957-58	18.3	+5.1*	+3.1*					+1.8*	+2.6*
Tinwald	1958-59	20.8	+4.7*	+5.6*	+2.8*	+2.2*	+0.8		+3.4*	+1.8*
Lowcliffe	1958-59	18.2	+3.1*	+4.0*	+2.3*	+1.2*	+0.9*		+2.0	—0.1
Lowcliffe	1959-60	25.0	+6.5*	+6.0*	+3.2*	+5.1*		+0.2		
Newlands	1959-60	11.8	+2.4	+2.8*	+0.8	+2.5		—1.3		
Dromore	1959-60	6.6	+0.8	+1.0*	—1.5*	—1.1*		—0.2		
South Canterbury										
Fairview	1958-59	22.5	+2.5*	+1.5*	+1.1*	+0.6	—1.2*		+1.6*	+0.6
Fairview	1959-60	19.4	—0.7	—0.9	—1.0	+1.3*		—2.2*		
Southburn	1958-59	18.4	+5.4*	+2.9*	+0.7	—0.5	—0.4		+2.1*	+1.0
Southburn	1959-60	16.1	+1.2*	—1.3*	—1.6*	+1.6*		—2.6*		

* Significant differences and can be accepted as proven

However, many significant differences occurred among the other varieties also, and these may be summarised as follows:

Comparison	No. of trials in which compared	Difference in favour of	No. of times difference not significant
Redwood with			
Rocket	13	Redwood in 4 Rocket in 1	8
Golden Viking	11	Redwood in 7	4
Golden Viking I	11	Redwood in 6 Golden Viking I in 1	4
K5	7	Redwood in 5	2
K25	7	Redwood in 6	1
Marine	13	Redwood in 9	4
Rocket with			
Golden Viking	11	Rocket in 6	5
Golden Viking I	11	Rocket in 5 Golden Viking I in 2	4
K5	7	Rocket in 3	4
K25	7	Rocket in 4	3
Marine	13	Rocket in 10 Marine in 1	2
Golden Viking with			
Golden Viking I	11	Golden Viking in 2 Golden Viking I in 3	6
Marine	11	Golden Viking in 4 Marine in 2	5
Golden Viking I with			
Marine	11	Golden Viking I in 5 Marine in 1	5
K5 with			
K25	7	K5 in 3	4
Marine	7	K5 in 6	1
K25 with			
Marine	7	K25 in 2	5

Golden Viking II and Koto each appeared in the trials in one season only, and have been omitted from the table. Golden Viking and Golden Viking I appeared with K5 and K25 in only one season's trials and comparisons between these groups have also been omitted.

Summary of Comparisons

Redwood and Rocket were the highest yielding varieties, the advantage tending to be with Redwood. Golden Viking and Golden Viking I have yielded fairly similarly. Marine tended to be the lowest yielder (though not lower than Koto in the one season they were compared).

Maturity and Lodging

Though Marine was the lowest yielder, particularly when compared with Redwood, Rocket, Golden Viking, and Golden Viking I, it was consistently earlier than these varieties. This may be a valuable attribute in localities where earlier maturity is desirable. In addition Marine was the most resistant to lodging in trials where this occurred.

Tests for Oil Content

Samples of seeds harvested from the 1959-60 trials were tested at Crop Research Division, Department of Scientific and Industrial Research, Lincoln, for oil content, with the following mean results for each variety from six trials.

Oil Content as Percentage of Dry Matter

	Per cent
Marine	42.2
Rocket	42.0
Redwood	42.4
Koto	40.8
Golden Viking	42.6
Golden Viking I	43.1

Dry matter was the weight at 0.0 per cent moisture.

Composite statistical analysis over the results from the six trials tested showed that the oil content of Koto was significantly lower than that of any other variety and that Golden Viking I gave a higher oil content than Rocket. No other differences are significant. These results are from Departmental trials only and do not necessarily reflect the oil contents of linseed harvested commercially.

Future Trials

The variety trials are being continued. Attention is also being given to the fertiliser requirements of linseed. All of the 13 variety trials so far completed have included rates of nitrogenous fertiliser; but it appears that on the soils so far investigated this type of fertiliser has not been useful in increasing yields. An increased yield resulted in one trial only. The application of nitrogenous fertilisers has sometimes caused an undesirable delay in ripening.

Some rates of superphosphate used in the 1959-60 trials were all ineffective in promoting increased yields—indeed there were some small depressions—but insufficient evidence on the effect of this fertiliser is available and no conclusions can be made yet.

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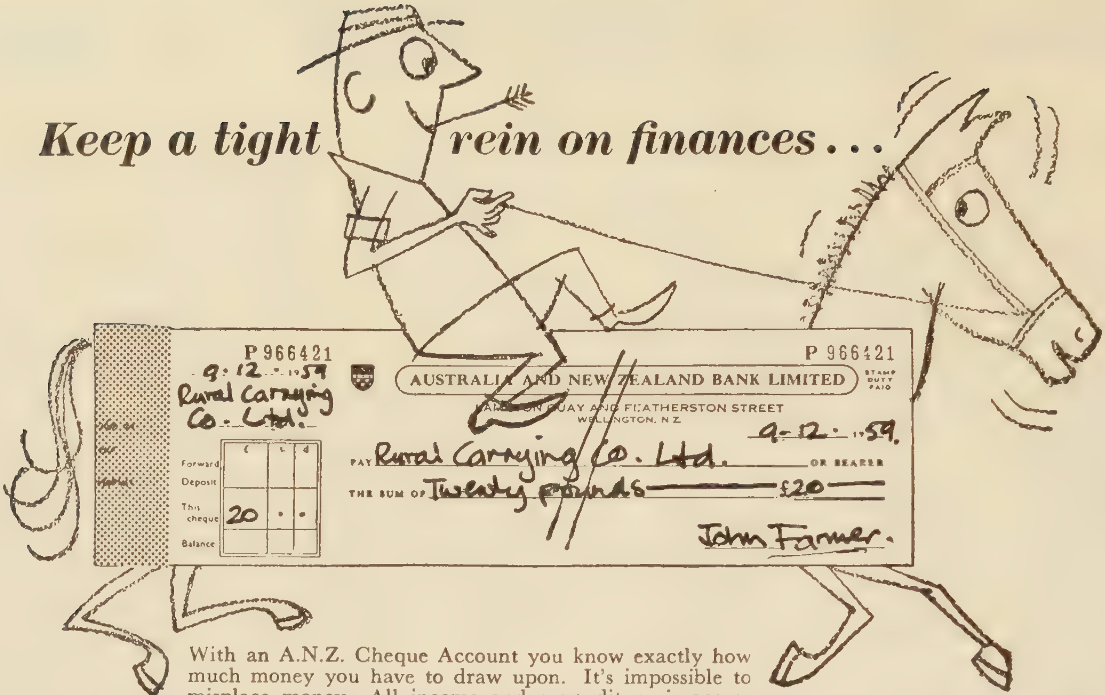
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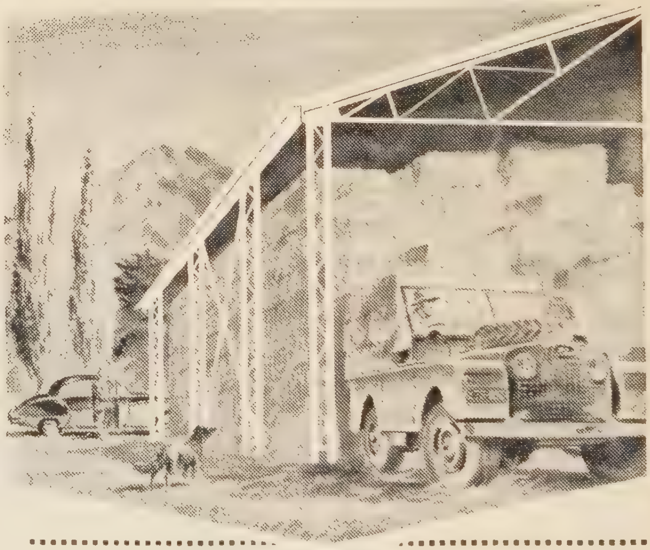

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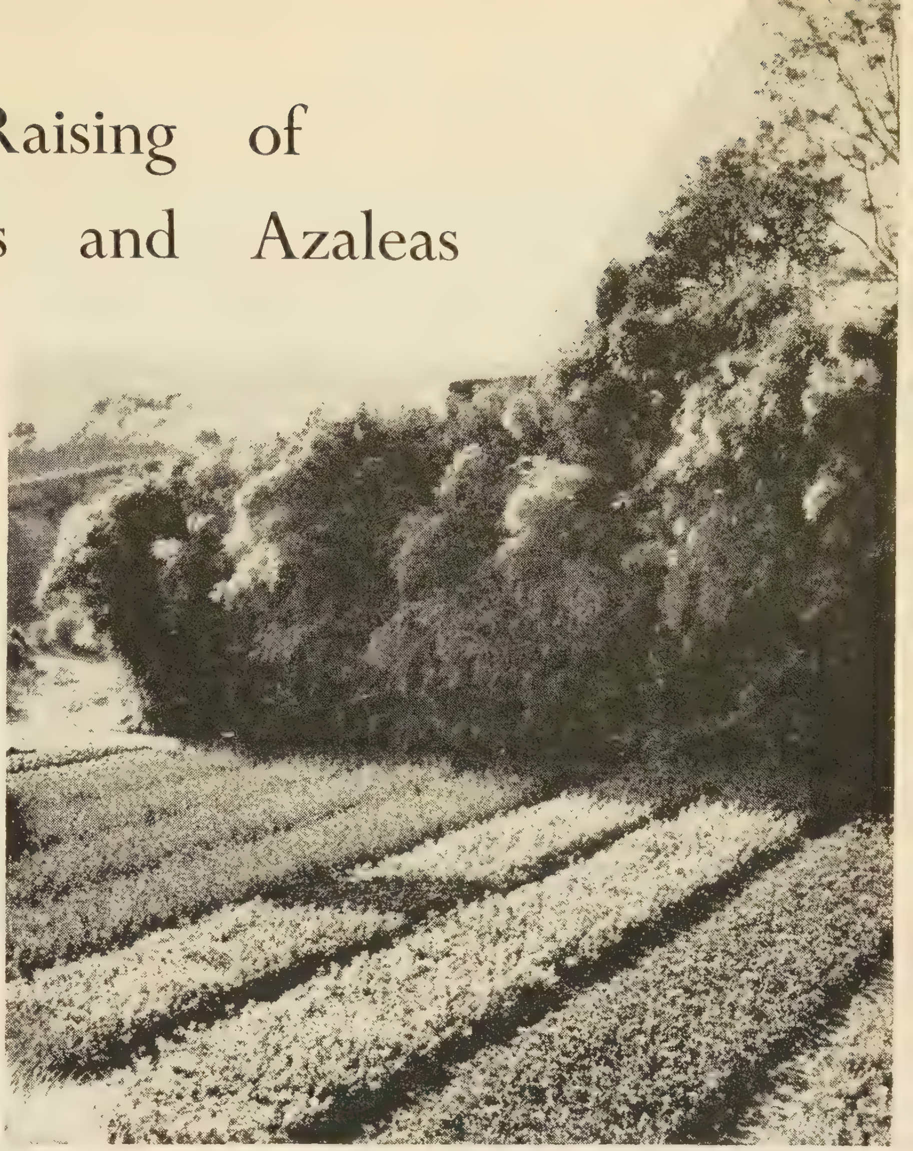
Commercial Raising of Rhododendrons and Azaleas

THE demand for rhododendrons and azaleas is rapidly increasing as the range of newer types becomes known to the public. To meet this demand, nurserymen must produce large numbers of salable plants true to name and type. The propagation methods are described in this article by I. Mayo, Plant Quarantine Officer, Department of Agriculture, New Plymouth.



The bed method of planting rhododendrons and azaleas, which is now commonly practised.

RHODODENDRONS and azaleas until comparatively recent times were thought of as different genera, but are now known to belong to one genus (*Rhododendron*) of the *Ericaceae* family. One thing which a number of the species *Ericaceae* have in common is their preference for acid soil conditions, which must be kept in mind when propagating and "growing on" in the nursery.

Rhododendrons

These plants may be propagated by layering, by grafting, from cuttings, and from seed. Growing from seed cannot be recommended because seedlings are rarely true to the parent plant. All seedling lines vary in vigour, type, and colour, and would have to be grown for a considerable time before they could be colour grouped for sale.

Experience has shown that a big percentage of seedlings are worthless, as they are inferior to the parents in colour, habit, etc. As good lines of true-to-type plants are readily raised by other methods, plants are rarely grown from seed by nurserymen.

Layering

Layering, one of the oldest methods of plant propagation, is a satisfactory way of raising rhododendrons and is still widely used. Layering requires a lot of land and a considerable amount of skilled labour per plant, so other methods which produce more plants per given area with a minimum of skilled staff are taking its place in commercial horticulture.

Layering is carried out in winter, when the plant is relatively dormant; if it is done when the sap is running freely, the bark is very easily loosened and the chances of a layer rooting when this happens are poor. Often only the light side branches of a plant are used, but when many plants are required, the whole bush may be used, even though it may 5 to 6 ft high.

Preparing a Bush for Layering

When the whole of a large plant is to be layered the main branches are sawn half way through before they are bent to ground level. This results in a portion of wood and bark joining the layered branch to the parent plant and sufficient food passes through this conducting tissue to keep the layers fed until they develop their own root systems.

A certain amount of manhandling is necessary when dealing with large branches and it would be very easy to loosen the bark in many places if the sap was running too freely. The best wood for the actual layer is matured 1-year-old wood, but 2-year-old wood will root fairly readily. Experience has shown that thinner growths root more rapidly than thick, vigorous ones.

Preparing the Layer

A slanting lengthways cut two-thirds way through the branch is made, the cutting being done from the base toward the tip; the length of the cut depends on the size of the wood, but is usually about 1½ in.

A trench about 3 in. deep and 12 to 15 in. long is made in the soil directly under the cut and the branch is then pushed into the bottom of the trench so that the soil keeps the cut open. A small wedge of wood can be pushed into the cut to keep it open, but this is often unnecessary. The branch will tend to spring out of the trench, so it

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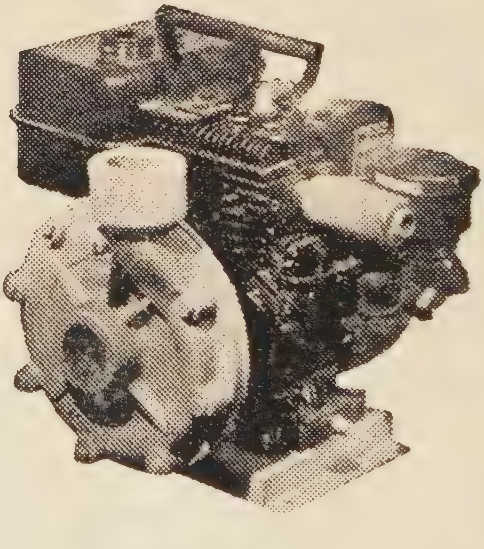

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is pegged down with wire or wooden pegs. When the branch is settled in the bottom of the trench the soil is replaced and firmed.

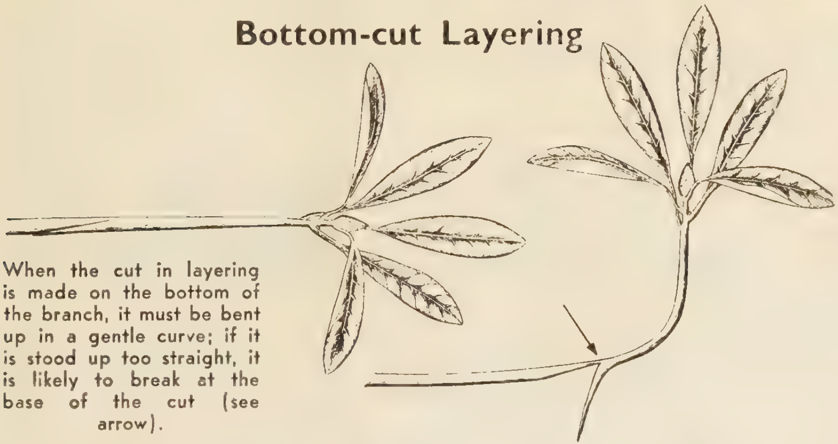
The above-ground tip of the layer is usually fairly upright when the operation is completed, but the important consideration is the angle of the underground wood. When the layering cut is made in the bottom of the branch, the underground portion of the layer must be bent in a gradual curve to bring the tip upright. This usually results in a plant having a base bent in the shape of a small hockey stick. The plant will be quite healthy and vigorous, but its shape is often spoilt by this bent base.

To avoid bent-base plants usually associated with layers, some nurserymen are making the layering cut on the top of the branch. The branch is twisted, either to the left or to the right, at the end of the cut to bring the tip of the layer straight up from the cut; the severed tongue of wood then points straight down (see diagrams below). This method produces a good, straight-stemmed plant.

Where rhododendrons normally grow well, they usually layer readily without any special attention to the soil, so no manure is added when covering the layer. Freedom of rooting and rate of growth vary between varieties, but usually a layer put down one winter is ready for planting up in nursery rows the following winter. The layers may be severed from the parent plant in autumn or they may remain joined until the young plants are lifted for planting in the nursery row. The time of separation does not appear to affect the young plants in any way.

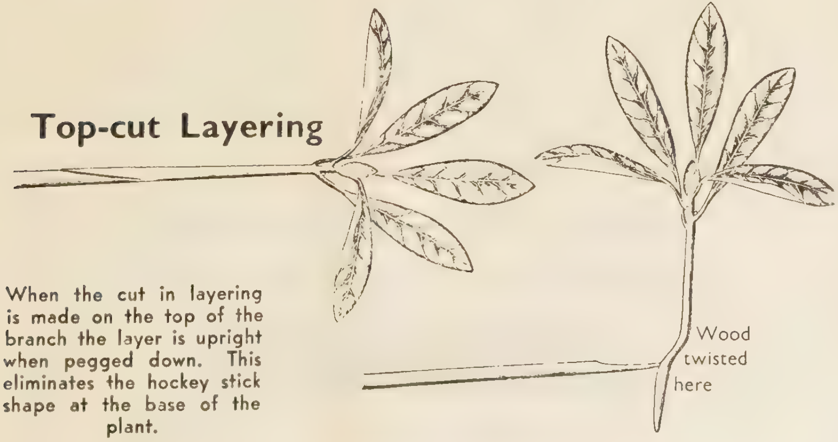
A rhododendron plant when the layering operation is completed. The whole plant is often used as is shown.

Bottom-cut Layering



When the cut in layering is made on the bottom of the branch, it must be bent up in a gentle curve; if it is stood up too straight, it is likely to break at the base of the cut (see arrow).

Top-cut Layering



When the cut in layering is made on the top of the branch the layer is upright when pegged down. This eliminates the hockey stick shape at the base of the plant.

Grafting

Grafting is widely used for propagating rhododendrons. It is usually done between late June and the end of August, both side and wedge grafts being used. With side grafting, the stock plant is left intact, the scion being inserted in the side of the stem of the stock, bound firmly with raffia, and the whole union sealed with wax or a suitable compound. The scion is usually inserted about 2 in. above ground level, but this height varies with the size of the stocks. With the wedge graft, the top of the stock is severed about 2 to 3 in. from ground level, a split about an inch long is made downward in the middle of the top of the stock and the scion inserted, bound firmly with raffia, and the union sealed.

The side graft is preferred to the wedge graft because the stock is left

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intact and continues to carry out all the necessary plant functions while the scion is uniting. The top portion of the stock is removed when the union between stock and scion is callused; this usually takes about two months.

Scions for grafting are similar to cuttings. Ripened tip growths, about 3 to 4 in. long, of the current season's growth are used.

Choice of Understock

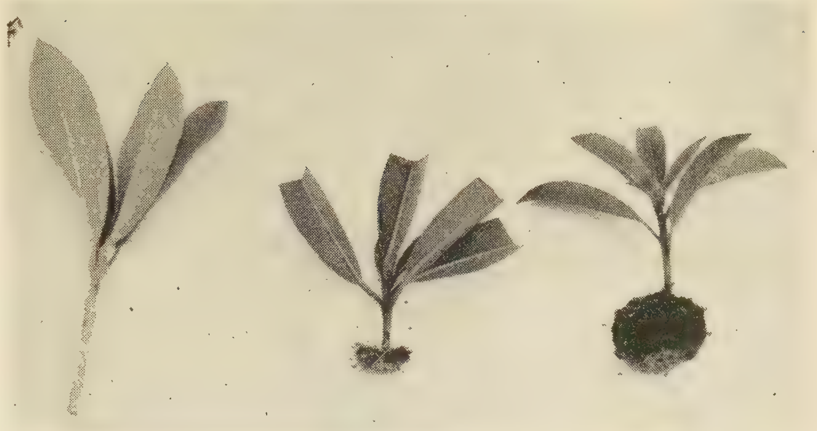
An important aspect of grafting is the choice of stock; it must be easily propagated, a vigorous grower with a good root system, and as closely related as possible to the scion variety. The following varieties are satisfactory as stocks: *Rhododendron* 'Sir Robert Peel', *R. decorum* (easily raised from seed), and *R. elegans*. *R. ponticum* has been used extensively as a stock in the past; it makes a vigorous plant, is compatible with most varieties, but it suckers very freely and for this reason its use is undesirable if other stocks are available.

Stocks may be raised from seed or from cuttings, the cutting method being most widely used. Plants grown from cuttings are usually fairly uniform in size and vigour and are ready for grafting far sooner than seedling plants. A further disadvantage of seedling plants is the range of vigour and type.

Cuttings for stocks are usually taken between late January and early March, ripened tip growth of the current season's wood being selected. These cuttings may be rooted in outdoor cold frames or in pits (heated or cold) in glasshouses. The outdoor beds should be prepared by adding sharp sand for drainage and peat to reduce the pH and to improve the moisture-holding capacity. The glass should be shaded with whitewash or scrim. A mixture of one part of sand and one part of peat or two parts of sand and one part of peat should be prepared if pits in a glasshouse are used.

A cutting should be from 4 to 6 in. long, the base cut straight and cleanly across at a leaf node, and the lower two-thirds of the foliage removed by cutting off flush at the stem with a sharp knife. A ½ in. longitudinal cut made at the base of the stem, which is known as wounding, hastens callusing, which must take place before rooting will begin.

Prepared cuttings are then dipped in a rooting hormone (any excess hormone being removed by giving cuttings a gentle tap) and planted as close together as the foliage will allow; the ends of the leaves may be removed to allow closer planting. When planting is completed, a good watering is given to settle the medium round the stems. The lower leaves should be about 1 to 2 in. above the surface of the rooting medium.



Propagation of rhododendrons from cuttings shown in three stages: Left—Prepared cutting. Middle—Rooted cutting from a propagation pit ready for traying or potting up. Right—Well rooted plant from a tray ready for planting in open ground.

If the cuttings are rooted in glasshouse pits, they are prepared as described above. The rooting medium is kept at about 60 to 65 degrees F if heated pits are used. The medium is well watered to consolidate it and knife cuts about 2 in. deep are made along a straight edge across the pit. In these the cuttings are set as close as possible. Watering is done at the completion of each row to resettle the rooting medium. The rooted cuttings are potted up in 3 in. pots and replaced where they were rooted until the roots start to penetrate the potting soil. The potting mixture is usually four parts of loam, two parts of peat, and two parts of sharp river sand. No fertiliser is added to this first potting-on mixture.

Plants are usually placed in lath houses or under shaded frames while they are forming a good root system. Some variation of rooting will be found when the cuttings are lifted; the majority will be well rooted, but a percentage will be just starting to root and some will be only callused. The slow cuttings may be planted back in the pits to finish rooting if the space is available and their numbers warrant it.

After being grafted, plants are held in warm, moist conditions until the unions callus. If temperatures are high, the plants benefit from occasional watering during the heat of the day; a fine mist—just sufficient to wet the foliage—is all that should be given each time.

With side-grafted plants the top of the stock should be removed when callusing is well advanced. Grafted plants are usually moved to cooler conditions to harden off; lath houses or lath-covered frames provide satisfactory conditions. Planting up in the nursery is governed by the time of grafting; plants grafted early in the season may be bedded in spring, but later lines may have to be held until autumn.

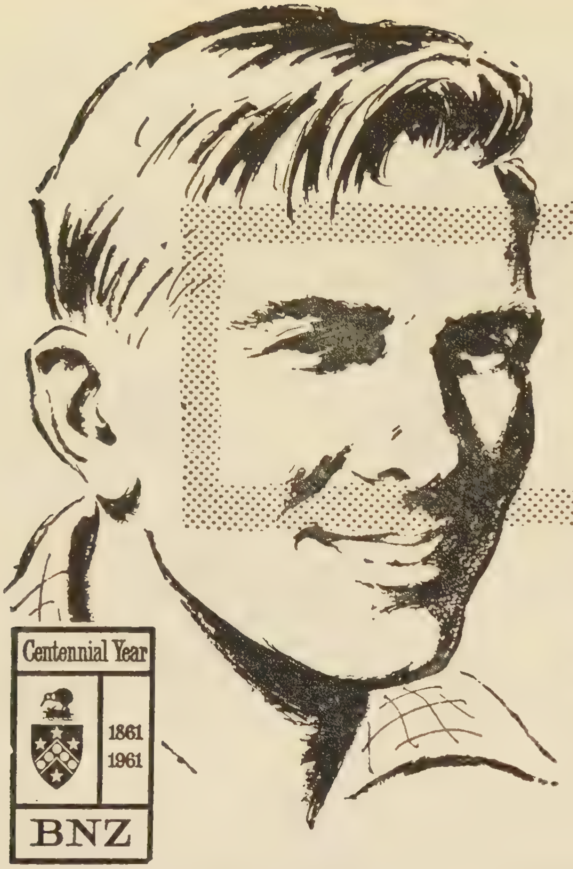
Cuttings

The growing of named varieties of rhododendrons on their own roots (from cuttings) is a method which is being used far more now than it has been in the past. A few varieties that rooted readily and consistently have been propagated in this manner for many years, but growing from cuttings was not a common practice. Many varieties produced only a small percentage of well rooted cuttings and others took such a long time to strike that the average nurseryman had to use faster, surer methods.

However, with the introduction of intermittent-mist watering, growers are finding that most varieties root so readily and rapidly that this method is likely in the near future to become the most widely used. A good plant can be produced in a shorter time than with most other methods and less skilled labour is required.

Cuttings are taken and prepared as described in the taking of cuttings for grafting stocks. When the cuttings are rooted they are planted up in 3 in. pots or trays in the potting mixture described in the raising of grafting stocks. They are then replaced in conditions similar to those under which they were rooted until the roots penetrate the new medium. Next they are moved to cool, shady conditions until a good, strong root system has developed. Plants are then ready for planting up in the nursery. Cuttings take from 4 to 10 weeks to root under mist watering and 4 to 6 weeks to re-root in the pot or tray medium.

When cuttings are rooted under mist a full misting programme is used until



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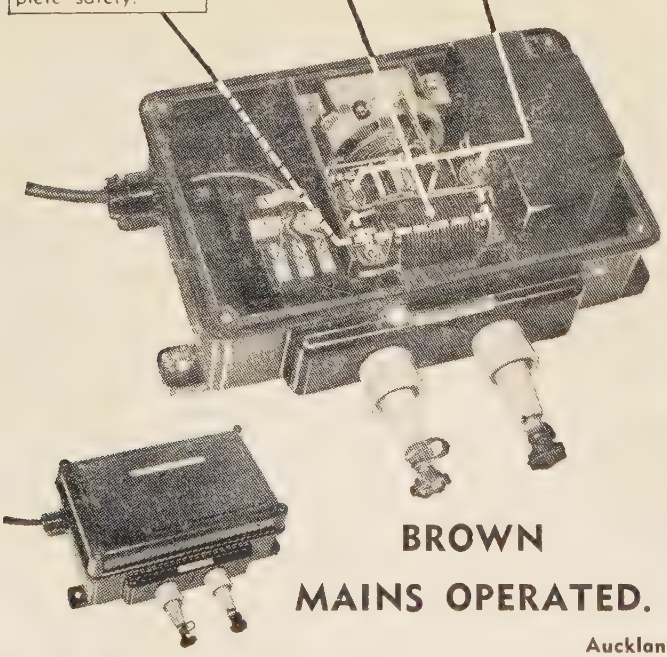

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a root system is established. The amount and frequency of mist application is then reduced to harden the plants and reduce the shock of lifting and potting. The cuttings may be planted in trays and the trays placed in a heated pit, or plants may be put directly into the pit

Cuttings planted in heated pits without mist take from three to six months to root

Planting up for Growing on

Soil conditions in a nursery may be too alkaline for good growth. Alkalinity can be reduced by the application of any of the following: Elemental sulphur, flowers of sulphur, sulphate of ammonia or aluminium sulphate. Horticultural peat can also be used but in the past it has been considered too expensive to use on a large scale.

The methods of planting up young rhododendron plants for growing on are changing. In the past the practice has been to plant 9 to 12 in. apart in the rows with the distance between the rows depending on the size and type of machinery in use, which usually necessitated rows being 18 to 24 in. apart. A bedding system now being used by most growers is resulting in better plants. Compost, silage, or well rotted animal manures are used if they are available when the growing-on beds are being prepared. The material to be used is spread over the ground and worked in roughly some months before the final preparation of the beds. Just before planting bed sizes are defined and the areas thoroughly cultivated to mix the manure.

Some growers spread a 2 in. layer of horticultural peat and work this in lightly just before planting. Bulky organic manures produce a better plant than fertiliser, but as they are not always available, fertilisers must sometimes be used. The ground is then well cultivated and a dressing (1 to 2 oz per square yard) is broadcast over the bed and raked in. A satisfactory mixture is (all figures are parts by weight) three parts of blood and bone, two parts of superphosphate, one part of sulphate of ammonia, and one part of muriate of potash. When bulky organic manures have been used no further feeding is given, but when fertilisers have been applied the plants usually get a light side dressing of the initial mixture about February. The side dressing mixture may have one part by weight of sulphate of iron added to it if the foliage shows any yellowing.

Planting distances vary according to the size of the plant and its habit of growth; rows are usually 1 ft apart with 8 in. between plants. This close planting makes the use of horticultural peat economic. The beds are top shaded about 4 ft above the plants with scrim, lath frames, or wire netting with branches laid on top. The broken light and cool root run produce better plants, even though plantings are close. Shading is removed in late summer to allow the plants to harden before lifting.

Rhododendron cuttings in a heated propagation pit in a glasshouse. Overhead are the pipelines, one on each side of the house, to supply mist.

The netting and branch method of shading appears to have some advantages over the other types; the netting is reasonably cheap, easily erected, and long lasting, and the branches (Lawson's cypress is favoured) are full and green when first put on and supply good shade. As the season progresses the branches dry out, their foliage falls, giving more light, and the plants are hardened gradually without any shading material having to be removed.

When growth starts after planting up, the terminal bud should be removed to prevent flowering and make lateral buds break into growth, giving a compact, bushy plant. There is considerable variation in the rate of growth of varieties. With the faster growing types a large percentage of the plants should be salable in two years and the small remainder may be carried to the third year. A small percentage of the slower growing varieties should be salable in two years, and the majority in three, with possibly a small percentage carried until the fourth season. When lifting of plants leaves large gaps in the rows the plants remaining are usually lifted and replanted in complete rows.

Azaleas

Though azaleas are botanically the same as rhododendrons, some different methods are used when propagating them. The main methods of propagation are from seed, from tip cuttings, and by layering; grafting is not practised now. A low-branching, bushy plant is preferred; grafting tends to produce a higher-branching plant and requires more skilled labour than other methods.

Raising from Seed

Azalea mollis, a deciduous plant, is the usual type raised commercially from seed. Experience has shown that when these groups are hand-pollinated the resultant seedlings will give

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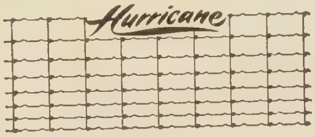

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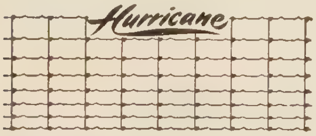

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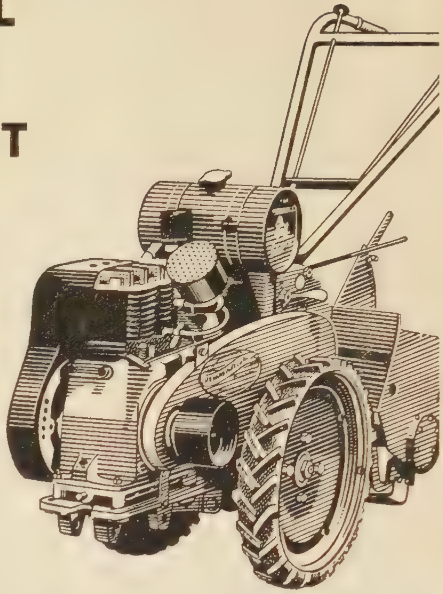

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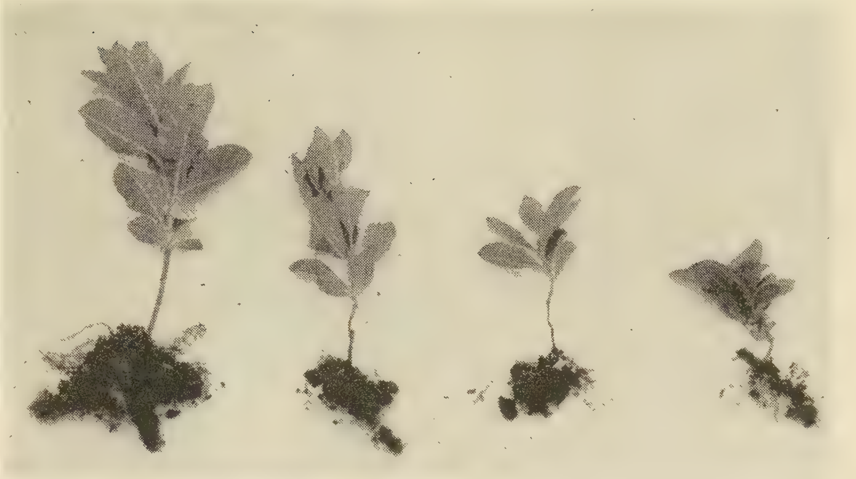
flowers of the same colour group as the parent. This also applies to an isolated plant or block of plants of one colour that are naturally fertilised. For example, if seed from an orange flowered plant is grown, the flowers from the seedlings will be yellow, orange, and red tonings. Seedling plants usually take three to four years to flower and are then sold as colour named seedlings, for example, red flowered *Azalea mollis* seedlings.



These seedlings were all taken from the same seedbed. This illustrates the need for size grading when plants grown from seed are being handled.

Seed is collected when ripe (usually in autumn and early winter) and stored in a dry place until it is sown in the following spring. Seedlings are raised in glasshouses in trays and in scrim-shaded beds in open ground. As damping off under glass may cause considerable losses in warm, moist areas, open-ground beds are to be preferred. Germination outside is usually excellent and provided the seedlings are sprayed periodically with a fungicide such as thiram, losses from damping off are usually light. Ilam hybrids are frequently propagated in this way.

Pests and Diseases

Rhododendrons

Rhododendrons are not troubled by many pests and diseases when grown outside, so very little spraying is necessary.

Fungous diseases: The main fungous diseases are leaf spots of several types, but they are rarely serious. Periodical sprays of bordeaux (6 : 8 : 100) keep these diseases fairly well under control.

Insect pests: The main pests are thrips and red spider. If both are present, malathion or nicotine sulphate is used. Sprays should be applied every 10 days until the pests are eliminated.

Thrips cause more damage than red spider; DDT emulsion applied at 10-day intervals gives good control.

Azaleas

Fungous diseases: These troubles are seldom serious. Periodical bordeaux sprays (6 : 8 : 100) control the little leaf spot seen. Where azalea leaf gall (*Escobasidium vaccinii*) occurs, this spray should be applied in early spring as the buds swell and all infected leaves removed and burnt.

Insect pests: These are few. Leaf miner is a serious problem and red spider troublesome occasionally. Malathion or nicotine sulphate is used for red spider and lindane for leaf miner. Spraying for leaf miner must be started at first sign of the pest. Applications at 14-day intervals should be continued for eight to 10 weeks.

The preparation of the seedbed is important. It should have a relatively high water-holding capacity (but must not waterlog), be as sterile as possible, and have an acid reaction (pH 4.5 to 5.5). Outside beds are prepared as follows:

The ground is deeply dug and levelled to ensure free drainage. A 2 in. layer of sterilised soil is then spread over the surface of the bed (sterilised soil eliminates practically all weeds and fungous diseases), and ½ in. layer of finely shredded horticultural peat is spread over the surface to give an acid growing medium. The completed bed is then given a thorough soaking and left for a day or two, depending on the weather, to drain with the scrim covers down. The frame is tent shaped with the ridge pole about 4 ft 6 in. high to allow plenty of air over the beds. Half-inch mesh wire netting is often placed under the scrim to reduce flapping in the wind.

The seed is sown fairly thickly and as evenly as possible on the moist peat and pressed down firmly with a board. No further covering is put over the seed, and the scrim shades are dropped. Periodical waterings with a fine rose keep the peat moist. As peat has a high moisture-holding capacity, care must be taken to avoid overwatering. Seedlings are sprayed with a fungicide every 10 to 14 days as soon as most of the seed has germinated.

Sowing in Trays

For sowing in trays similar methods and materials to those described above are used. The tray is filled to within an inch of the top with firmed, sterilised soil and ½ in. layer of peat is spread over this. The tray is then given a thorough soaking by placing it completely in a container, such as a sink, bath, or large deep metal tray, with sufficient water to come half way up the side of the seed tray. It is left until the contents are thoroughly saturated and then placed in a shaded spot to drain.

When the medium is drained the seed is sown as described above and the tray placed in a glasshouse or glass frame and shaded with a sheet of paper or a sheet of paper over a pane of glass. Seedlings are periodically watered and sprayed as in outdoor plantings, the paper or paper and glass being removed when the seeds begin to germinate.

If glass and paper have been used, the paper is removed and the glass propped up about ½ in. on one edge for the first day or two to get the tiny plants used to harder conditions; the glass is raised higher each day for about a week and then is removed. The sheet of glass is turned over at least once a day to dispose of large drops of water resulting from condensation on the under side of the glass.

Seedlings are pricked out into trays and placed in shaded conditions or in beds and shaded, usually when they are about an inch high. As a line of seedlings will vary considerably in vigour, some size grading is done during pricking out, the large, medium, and small plants being planted in groups as much as possible. This variable vigour must be taken into account each time the plants are handled so that some grading at an early stage makes later handlings easier. For transplanting into boxes or beds the soil mixture is the same; a mixture of equal parts of sharp river sand, loam, and peat should provide a satisfactory growing medium. No fertiliser is added at this stage.

Planting distances vary, but 2 to 3 in. between rows and 1 in. between plants is usual. Seedlings raised in open beds are shaded, watered, and sprayed (as described for the seedbed stage) when transplanted into open beds. When glasshouse-raised seedlings are transplanted into trays, they must go back into glasshouse conditions for a week to recover from the shock of moving before being removed to cooler, harder growing conditions in a lath house or under shaded frames.

Most of the plants will be ready for planting out in nursery rows 12 to 18 months after the seed is sown. A percentage of the plants should flower in three to four years from seed, but some will take five to six years.

Type of frame frequently used to protect outdoor sowings.

Layering

Layering was once widely used for most types, but tip cuttings are now giving such good results that layering is rarely used except for *A. mollis.* Layering is carried out as described for rhododendrons.

Tip Cuttings

Propagation by tip cuttings is used with the deciduous azalea 'Ghent' and the evergreen 'Indica' and 'Kurume' groups. Firm (not hardened) tip growths about 1½ to 2 in. long are chosen. Cuttings are collected over several months because there are early, mid season, and later flowering varieties. The bulk of the cuttings are collected during November, December, and January.

A good indication of the desirable condition of the wood is when the growth breaks with a slight but definite snap about 1½ to 2 in. back from the growing tip. Fair results will be achieved with ripened wood taken later in the season, but usually the percentage of cuttings which strike is lower, the time of rooting longer, and the growth of the cutting slower.

When dealing with this fairly soft wood it is important to get the cuttings from the plant to the propagating pit as quickly as possible to prevent drying out and wilting or to hold them under conditions where they will not flag. It often takes some time to collect a large number of cuttings, but the effects of any such delay can be minimised by picking the cuttings into a large plastic bag. The inside of the bag should be lightly sprayed with water before use and placed in the shade during working. If the cuttings cannot be handled for some time after collecting, they will remain in good condition for several hours if they are left in the bag, provided they are given a further spray with water and the bag is put in a cool place.

Preparation of Cuttings

Cuttings are prepared by severing them cleanly just below nodes and removing the foliage from the lower halves of the stems. A sharp knife should be used and the leaves removed as cleanly and as close to the main stems as possible. Cuttings after being dipped in hormone and given a gentle tap to remove the excess powder are ready for planting. Cuttings will strike without the aid of a hormone, but its use increases the percentage that strike, shortens the rooting time, and tends to give a more vigorous root system.

Cuttings are usually struck in unheated pits or in trays in glasshouses. Bottom heat may be used, but such good results are obtained without it that heated pits are usually saved for plants which need them more. Pure sharp river sand and a mixture of two-thirds sand and one-third peat are both good rooting mediums. Though azaleas root readily in pure sand, which often has a high pH, their preference for acid conditions (low pH) must be given more consideration when cuttings are grown on.

The medium in the pit or tray is levelled, made thoroughly wet, and firmed by tamping. A knife is used along a straight edge to make a cut across the pit or tray ½ to 1 in. deep, depending on the size of the cuttings. The cut is only the thickness of the knife blade, but this width is adequate. The cuttings are placed in the cut with the bottom leaves just clear of the medium and as close together as the foliage will allow without overcrowding.

After each row is completed a good watering is given to settle the medium round the bases of the cuttings. When planting is finished the line is sprayed with a fungicide and covered with sheets of glass or clear plastic. This covering is lifted daily to inspect the cuttings and the medium and to remove any leaves that may have yellowed and dropped.

Many propagators prefer plastic to glass for a covering; initial outlay and replacement costs are low, it is easily and rapidly handled, and it does not need to be turned at least daily to remove condensation. Plastic should be kept twice, preferably three times, as far away from the plants as glass, as humidity is higher under plastic and more air is required.

When humidity is high a close watch must be kept for fungous diseases. Cuttings should be sprayed every week or 10 days even if trouble is not apparent.

Most of the cuttings will be rooted in five to six weeks. Those which have callused but not rooted and those which have just started to root may be replanted in the pit if space is available and if their numbers warrant it. The mediums and methods already described would be followed if the cuttings were planted in trays instead of directly into a pit. The soil mixture into which the rooted cuttings are planted up conforms with the plant's preference for acid conditions; a mixture of equal parts of sharp river sand, loam, and peat is satisfactory. No fertiliser is added to this mixture.

The rooted cuttings are planted up in trays with about 1 in. between plants and 2 in. between rows and put back in the glasshouse until the roots have penetrated the new medium, which usually takes 10 to 14 days. From the glasshouse they go to shaded cold frames or a lath house and are ready for planting up in autumn or the following spring, depending on whether the cuttings were taken early or late.

As with rhododendrons the trend in planting up is changing; the row system is being replaced by bedding. Beds are prepared as for the rhododendrons, but no shading is used; planting distances vary, but rows are usually 9 in. apart and plants 8 in. apart. With some very small growing types the same distance between rows is allowed, but only about 5 in. between plants.

What Should Your Children Eat?

[*Niederer*

IN the first part of this article, which appeared in last month's issue, Judith Ferrier, Home Science Instructor, Department of Agriculture, Christchurch, showed that each meal should be planned not as an isolated unit, but as a part of the whole to contribute to the total food requirements of the day. In this way elements low at one meal can be made up at another, with the result that over a period of days the pattern will average out to one which is complete and nutritionally adequate in all respects. It would be almost impossible to plan each meal as a nutritionally complete unit. In this concluding part of the article she deals with the sources of minerals and vitamins.

IDEALLY each meal should make up about a third of the day's food intake, with a balance achieved between the body-building **protective foods** and the **energy-giving foods**, which supplement them and provide bulk and calories for warmth and energy.

Protective foods are: Milk; cheese; legumes; meat, fish, liver; fruit; cod liver oil; eggs; vegetables; iodised salt.

Energy-giving foods are: Fats; sugars; cereals; starches.

In addition the body needs certain mineral elements and vitamins which are normally supplied by a well balanced mixed diet.

Of the minerals, iron (discussed in the first part of this article), iodine, and calcium are among the most essential.

As iodine is deficient in most New Zealand soils, we depend almost entirely on iodised salt for the amount we need each day. A lack of iodine in the diet will result in the development of goitre, and though there are now comparatively few goitres to be seen in New Zealand, this has only recently been so, and is almost entirely due to the now widespread use of iodised salt.

It would take 9 lb of cabbage or 44 lb of bread eaten each day to supply the body with the iodine available from the 1/5 oz of iodised salt most people would use with their food.

Specify Iodised Salt

Not all salt is iodised. When buying salt, ask for iodised salt and buy it in small amounts which can be used fairly quickly, as over six months the iodine content of the salt decreases considerably.

Without any other source of iodine the daily iodised salt intake will be sufficient to prevent a deficiency. Land animals and cereals have almost no iodine to contribute to the diet, but sea fish, shellfish, and custards and jellies made from seaweed (commercially available or home made) will boost the iodine intake. Highly seasoned foods are not good for children, whose iodised salt intake can be very steadily maintained if they eat porridge every day.

As a variation of porridge try this adaptation of the Swiss dish muesli, which is likely to have certain appeal.

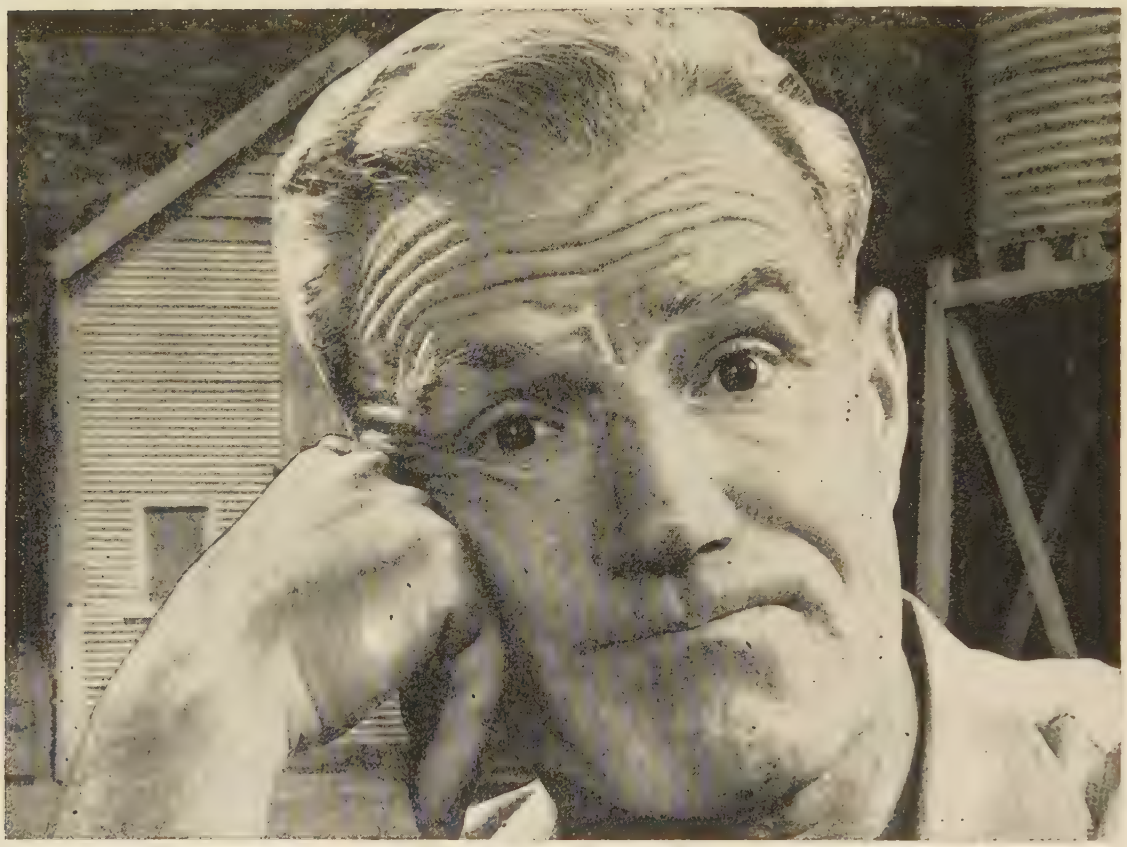
Fruit Muesli

3 tablespoons of rolled oats
½ cup of water
3 tablespoons of sweetened condensed milk
1 teaspoon of salt
Juice of 2 lemons
6 medium apples, grated
3 tablespoons of grated nuts (optional)

(4 to 5 servings)

Soak rolled oats in water, milk, and lemon juice overnight. Just before serving, add the grated apples (skin and core included). Stir apples in well to preserve the colour. Nuts and any

all right, I'll buy it...



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other fruit finely cut, for example, bananas, peaches, currants, and dried fruit, can be used to decorate it or they can be folded in. The muesli is not cooked.

As a change, make the morning porridge with all milk or part milk and part water instead of all water, but if it is made with milk, stir it all the time.

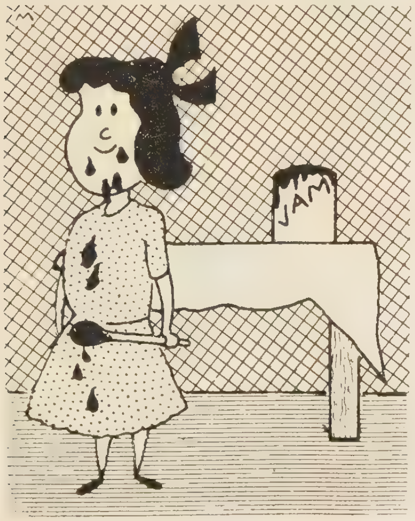
Milk the Best Source of Calcium

Milk is the best source of calcium available to children, who should be encouraged to take as much each day as they will. Cheese is also an excellent source of calcium, and a fair supply is available from eggs and green and root vegetables.

The recommended daily allowances of milk for children from two to 14 years are 1¾ pints; for children one to two years it is 1⅓ pints.

Adults, too, should have at least 1 pint of milk each day, part or all of which can be taken as skimmed milk if overweight is a problem. Skimmed milk is identical with whole milk in every respect except for the fat and its calories, which are greatly reduced with the removal of the cream.

Calcium is essential for growth, which depends on the development of bones, both in length and strength. The supply needed goes almost exclusively to be laid down to build and strengthen bones and teeth. Therefore the growing period is a time when there must be sufficient calcium to satisfy this demand, but when growth has stopped there must still be a generous supply to maintain bone strength. Adults need their milk each day.



Where the supply of calcium is insufficient the bone, as it grows larger, becomes increasingly short of calcium and consequently weaker, until in a severe deficiency it is not strong enough to support the body weight and bends, leading to the condition known as rickets.

If children make a fuss over drinking their milk by itself, let them have it in some other form. The addition of 2 tablespoons of powdered milk to the dry ingredients in baked products will help to keep up the consumption level in a happier atmosphere, as will the following suggestions for dishes prepared with milk as a main ingredient.

Lemon Custard

1 pint of milk
¾ cup of sugar
¼ teaspoon of salt
1 lemon, juice and grated rind
2 tablespoons of cornflour
2 eggs, separated
2 tablespoons of sugar (meringue)

(4 servings)

Mix cornflour to a paste with a little of the milk. Add to remaining milk, sugar, and salt in top of a double boiler. Heat to boiling point, stirring constantly. Cook one to two minutes. Pour slowly into beaten egg yolks, stirring. Cook over hot water, stirring occasionally until mixture is thick in eight to 10 minutes. (Keep lid on when not stirring.) Cool considerably. Add lemon juice and rind. Whip the egg whites stiff and fold through the mixture or make a meringue with the egg whites and 2 tablespoons of sugar. Pile on top and brown eight to 10 minutes at 375 degrees F.

Junket

2 cups of milk
2 teaspoons of sugar (optional)
¼ teaspoon of flavouring essence
1 teaspoon of rennet

(4 servings)

Heat milk to body temperature with sugar, stirring to dissolve it, but do not allow the milk to exceed this temperature. Pour into a serving dish. Add essence and rennet. Stir for half a minute. Sprinkle with nutmeg and leave to set in a warm place. Once set it can be chilled.

Plain junket can be varied by adding 2 teaspoons of chocolate syrup or coffee essence.

To encourage poor appetites set the junket in individual glasses on top of a layer of raw or stewed fruit.

Junket Ice Cream

1 cup of milk
1 teaspoon of rennet
¾ cup of cream
3 tablespoons of sugar
¾ to 1 teaspoon of vanilla
Pinch of salt

(3 to 4 servings)

Make junket. Add sugar, vanilla, and salt to the cream. When the junket is just set beat with the cream for three minutes. Pour into tray and freeze until firm round the edges. Stir and freeze firm.

MILK RECIPES

Floating Islands

4 eggs, separated
¼ cup of sugar
Pinch of salt
2 teaspoons of brown sugar
½ teaspoon of vanilla
1 pint of milk
Additional milk

(4 servings)

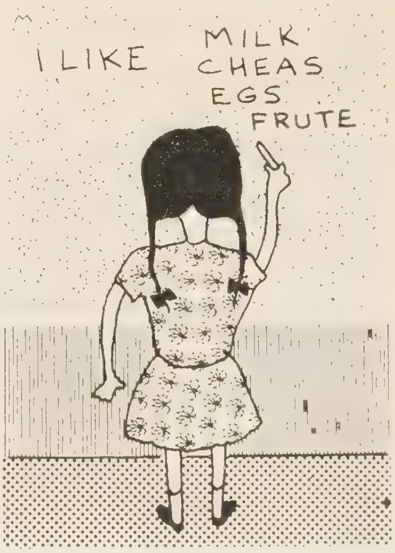
Combine egg yolks with sugar, salt, and vanilla. Blend into milk and cook over hot water, stirring until thickened. Do not overcook or custard may curdle. Cool saucepan quickly in a pan of cold water, then pour custard into individual dishes. (If desired, put a layer of stewed fruit or sliced banana with lemon juice in the bottom of each dish.) Beat the egg whites with brown sugar until they are stiff. Drop into boiling milk by the spoonful. Poach. This will only take one minute. Lift out with a draining spoon and place on top of the cold custard.

Cheese Custard

2 eggs
1 cup of soft breadcrumbs
1¼ cups of milk, scalded
1¼ cups of grated cheese
1 teaspoon of salt
⅛ teaspoon of pepper

(4 servings)

Add breadcrumbs, cheese, and seasonings to the hot milk (off stove).



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Beat the eggs well and combine carefully with the other ingredients. Pour into a greased oven dish and bake 20 to 30 minutes at 375 to 400 degrees F until set. Serve with baked tomatoes.

Cream of Pumpkin Soup

¾ lb of pumpkin
2 cups of milk
2 tablespoons of butter
2 tablespoons of flour
1 teaspoon of salt

(3 to 4 servings)

Cook the pumpkin in a little boiling salted water until tender. Make a white sauce. Melt the butter, blend in flour and salt, and stir in the milk slowly. Cook until thick, then boil two to three minutes.

Drain pumpkin and reserve the liquid. Sieve or puree the pumpkin and make up to two cups with the vegetable stock. Reheat and **add this to the hot sauce**, stirring to blend. Curdling may occur if the sauce is added to the vegetable puree.

Cream of Tomato Soup

2 cups of tomato puree or juice
2 tablespoons of butter
4 tablespoons of flour
2 cups of milk
½ teaspoon of salt

(3 to 4 servings)

Melt the butter. Blend in flour and salt. Add the tomato puree gradually and cook until thick. Boil one to two minutes. **Add slowly to the cold milk**, stirring to blend. Heat quickly stirring. It should not curdle made this way.

Preserving Tomato Puree

10 lb of tomatoes
2 medium onions
2 stalks celery (if obtainable)
1 tablespoon of salt
1 dozen peppercorns

Cut the tomatoes in small pieces, removing any hard, green parts. Place in a shallow pan with the chopped onion and celery. Add salt and peppercorns. No water. Cook until soft and reduced by about half. Rub through a coarse strainer. Reheat to boiling point and pour into hot sterilised jars to within ½ in. from the top. Use sterile lids and process for five minutes in a boiling water bath or 15 minutes in the oven at 250 degrees F. To save time blanch and skin the tomatoes and omit the sieving process. The celery and onions will need to be cut very finely for this method.

Need for Phosphorus

Phosphorus is needed in conjunction with the calcium for bone growth and also for the growth and maintenance of the tissues. Protective foods are a good source of supply.

It is easily seen that the mother need not worry unduly about the diet for her children if she concentrates on a variety of foods and teaches the children to enjoy their meals. The minerals and vitamins will be supplied without any need for supplements from pills and potions.

[*Sparrow*

A year-round supply of vitamin C is available from fruits and vegetables in New Zealand. Make good use of it by serving fresh fruit and vegetables raw whenever possible or cook them with due respect for the ease with which vitamin C is destroyed.

Sources of Vitamins

Vitamins are needed by the body in very small amounts, but they are necessary to enable the body to utilise the other food elements taken in. A mixed diet will be adequate in all the necessary vitamins, but as these are easily destroyed by careless handling and cooking, what seems an adequate allowance could become only a fair supply.

Vitamin A

Vitamin A is present in dairy products, green and yellow vegetables, fruits, liver, egg, and cod liver oil. There is a loss during long, slow cooking, especially in open utensils. Add vegetables to stews in just adequate time to cook. Don't start them with the meat and cook them for hours. Pick vegetables as late as possible before they are needed.

As light and air speed up the destruction of this vitamin, keeping milk covered and in a dark place is important, and it would be a good idea to store cod liver oil in the same way so that as much of the vitamin A as possible is retained even in doses from the last of the bottle.

Vitamin B_1

The vitamin B_1 group is found in unrefined whole grain cereals, wheatgerm, pork and bacon, milk, meats, yeast and yeast extracts, and vegetables. This group of vitamins is destroyed by the high temperatures used during the production of ready-to-eat cereals, making their food value limited almost to the milk taken with them.

They are soluble in water and destroyed by alkali; hence the reason for cooking vegetables in only a little water with no soda. Keep the lid on for quicker cooking and try to time the whole meal to be served immediately the vegetables are ready, as destruction of the vitamins is accelerated when the vegetables become overcooked.

Remember, too, that if the vegetables are dished as soon as they are ready and then kept hot in the oven or warming drawer waiting for the rest of the dinner, all the good done by cooking them for the correct time is undone. They continue to cook more slowly in the oven and lose their food value to the same extent as they would through being cooked for too long in the first place.

Because of the very short time needed to pressure cook green vegetables they will be thoroughly overdone if they are cooked together with the root vegetables, which seems a fairly common practice. For this reason it is probably wiser to restrict the pressure cooking of vegetables to those which would normally take a longer time. Cook the green vegetables by the usual method, for in this way when they are added to boiling salted water, they take approximately the same time to cook as do the root vegetables done in the pressure cooker, enabling both types to be perfectly cooked and ready to serve together.

Vitamin B_2

Vitamin B_2 (riboflavin) is contained in milk, meats, eggs, whole grain cereals and yeast extracts. This vitamin is extremely light sensitive and soluble in water. Milk is an excellent source of vitamin B_2, but is often a poor source, as 60 per cent of the vitamin is lost if the milk is allowed to stand in the light for two hours. Sunlight can destroy it even more quickly beside allowing the development of off flavours.

Vitamin C

Vitamin C is widely available all year round in New Zealand. In summer sources are citrus fruits, tomatoes, red and black currants, gooseberries, tree tomatoes, and green, leafy vegetables. In winter it can be obtained from 'Sturmer' apples (five times as much as other apples) green, leafy vegetables, and root vegetables, especially swede turnips. Potatoes should supply a regular source of vitamin C, as they are eaten nearly every day, but the potatoes on the plate often contain almost none.

This vitamin is lost rapidly from cut and broken surfaces, for example, those in mashed potatoes and root vegetables, more particularly if the vegetables have been mashed early and kept warm.

Similarly, considerable amounts are lost from vegetables cut up finely for cooking or salads. Tear the salad greens sometimes or cut them coarsely just before they are served. The longer the time the cut surface is exposed to the air the greater the amount of vitamin C lost.

As vitamin C will dissolve out in water from cut surfaces, this explains the reasons for:

1. Cutting up the vegetable as little as possible.
2. Not leaving the vegetable to soak in cold water or starting to cook in cold water (which takes so much longer).

Prepare the vegetable just before cooking. Cook quickly with the lid on and serve at once. Copper utensils speed up the destruction of vitamin C where the copper comes in contact with the food. Avoid copper preserving pans for boiling fruit.

Vitamin D

Apart from cod and halibut liver oils, eel flesh is about the only food containing much vitamin D. The sunshine on the skin produces a supply which is fairly constant in New Zealand, where the children play outside all the year round.

Further Reading

For those interested in further information on this subject the following publications are recommended as reliable, easy to read, and relatively inexpensive references.

"Food and Health", Department of Agriculture Bulletin No. 338, by Evelyn E. Moore; 1s. 6d.

"Modern Mothercraft", handbook of the Plunket Society.

"Good Nutrition", published under the auspices of the Department of Health; 3s. 6d.

"School Lunches" and "Daily Dietary Pattern", Department of Health leaflets; available free from district offices of the Department of Health.

GARLIC— Robust or Subtle

SOME people like plenty of garlic flavour; others want just a whiff. Either way, this powerful little herb enhances food and makes a dish extra special.

Pivoting the knife with the palm of the hand when chopping garlic.

THE garlic bulb, member of the lily family, is made up of sections called cloves. Store the bulbs in a dry place. To use, take out a clove and peel off the papery skin. Among time-saving garlic products are garlic salt and powder, chips, juice, and spread.

Here are five different seasoning styles for garlic:

Press or Crush It

Squeeze or crush a clove either in a special press or with the back of a teaspoon so that all the juice comes out. It can be crushed into salt and used as a flavouring for garlic butter, salad dressings, marinades, or any suitable savoury dish.

Mince It

A French chef's knife can mince several garlic cloves at one time. Hold the knife handle with the right hand; lightly rest the palm of the left hand across the squared off or blunt edge of the knife. Keep the point of the knife on the board as a pivot and swing the blade up and down and back and forth over the garlic as you cut. Chefs favour this minced style for cooked dishes, stews, and sauces. It is a good idea to reserve a small chopping board for garlic and onion alone.

Rub It

To give your tossed salad a lift, season your wooden salad bowl with garlic. Rub the cut end of a clove on the inside of the bowl.

Meat also takes on a new flavour when rubbed with garlic, especially if the juice is pressed out also.

Spear It

Before adding garlic to a cooking liquid slash the cloves several times. Spear each clove with a toothpick to hold it together. When serving the stew it is then easy to remove the seasoner and spear. There is then no chance that a piece of garlic will turn up in a serving.

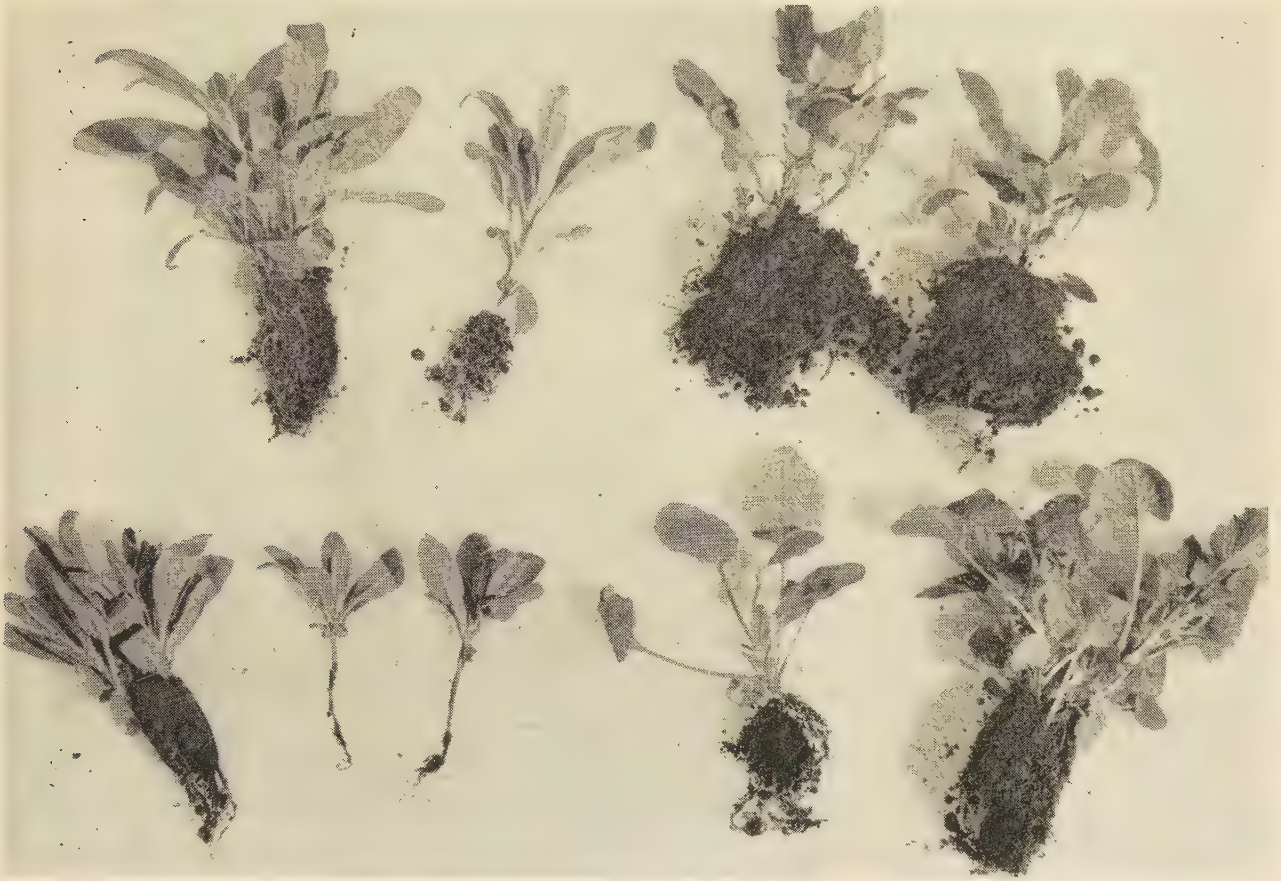
Hide It

For a mild or strong flavour in a roast insert a few or many garlic cloves here and there. With the tip of a knife make a small slit in the meat. Press apart with the blade and with a quick twist insert the garlic into the slit and push it down. Then without removing the knife repeat the motion to tuck in a sprig of parsley to mark the place. After the meat has roasted you can see at a glance where the garlic is and remove it.

—*GWYNNETH BOSTOCK,*
Home Science Instructor,
Department of Agriculture,
Palmerston North

FLOWER GARDEN

SELECTING AND BUYING PLANTS



[Sparrow

▲ Top left—Good-quality pre-wrapped stock plants. Compare the root system with those shown immediately below.

Top right—Box-grown pansies with a large ball of roots.

Lower right—Good-quality pre-wrapped pansies.

IN a small garden mistakes in selecting and buying plants are costly in money, space, and time; to avoid them it is important that plants should be suitable for the purpose for which they are wanted and will grow well in the position, soil, and climate. More care in the choice of species and in selecting the actual plants would result in fewer failures, losses, and disappointments.

By J. S. SAY,
Horticulturist,
Department of Agriculture,
Auckland

PLANTS should always be bought for a purpose: a shrub for winter flowers or a particular position, annuals for cut flowers or a mass display during summer, a tree for shade. Plants may look well in a nursery or a friend's garden, but they must suit the position, purpose, and conditions in the garden for which they are bought.

Buying from catalogues can result in disappointments. However, many New Zealand firms issue well illustrated catalogues giving botanical and accepted common names and reliable descriptions which give the customer enough information to judge the appearance, requirements, and merits of the plants.

Other firms simply list plants or seeds under their botanical and common names with perhaps a very brief description. If these are used in conjunction with a good reference book or periodical written for New Zealand conditions, there can be no mistake about the plant one is buying.

Overseas publications are handy but cannot always be depended on, as they deal mainly with climates and conditions very different from our own.

Nor should plants be bought only because they are fashionable. For example, camellias have become very popular, but they can never be really satisfactory on a light sandy soil in a hot, dry garden.

Never buy plants simply because they are cheap.

Once a garden is established and the gardener gains experience a more adventurous policy can be adopted and a great deal of interest and pleasure will be had from trying out new varieties, unknown plants, and those which are thought to be just possible to grow in the garden. If they are a

(Continued on page 403)

POINTS TO WATCH WHEN BUYING . . .

TREES AND SHRUBS

Balled, Potted, and Canned Plants

The leaves should be fresh and clean. Beware of plants with dull, dusty, wilted, or yellowing leaves or which have dropped a lot of leaves. The last three symptoms usually indicate that the plant is, or has been, very dry at some time or it could indicate that it has been left soaking in water too long and the roots are starting to rot.

The ball or pot should be moist but not soaking wet and sodden. A good idea of the moisture can be got by feeling the pot or ball and by testing the weight.

Avoid very dry plants even if they still look healthy, for some plants, especially conifers, may not show foliage damage for some weeks.

Pots or cans should be almost full of soil, with no roots exposed. It does not matter if a few small roots are growing through the drainage hole, but avoid plants with large masses of such roots and those from which large projecting roots have been removed.

Bare-rooted Plants

Bare-rooted plants should have an adequate root system. The roots should be plump and pliable. Beware of plants which have stringy, dried out roots and those which have roots exposed to sun, wind, or draught. They should be heeled in or wrapped.

Trunk and stems should not be shrivelled or dull in colour.

Roses should not have dead areas at the top of the canes.

Do not buy any plant which has roots with a dark brown waterlogged appearance or which show a brown stain through them.

Bare root evergreens should always be heeled in or have the roots wrapped in moist hessian.

* * *

HERBACEOUS PERENNIALS

Do not buy clumps or crowns which are exposed to wind, sun, draught, or a hot, dry atmosphere. They should be packed in damp sawdust or moss.

Hold carnation leaves up to the light. If they show streaks, they are probably suffering from a virus disease. Do not buy gerberas which show a whitish deposit on the leaves; it is white rust.

Small lumps or blisters on the leaves or stems of chrysanthemums are caused by chrysanthemum gall midge and brown leaves at the base of the plant may be the result of eelworm infection.

SEEDLING PLANTS

Seedlings should be firm and compact and a good healthy green.

Avoid plants which are soft, tall and drawn and yellowish, and stunted and purplish; also plants which are flagging or bruised, plants which have obviously been wrapped for days, especially if they are left standing in water, or exposed to sun, draughts, wind, or a hot, dry atmosphere.

Seedlings should have good root systems; well developed tops are of little use without roots to support them.

Buy plants which are in season. Unfortunately, many flower and some vegetable plants are on sale throughout the year whether or not it is the best time to plant them and inexperienced gardeners are frequently disappointed when plants fail to thrive.

* * *

BULBS, CORMS, AND TUBERS

Do not buy bulbs which are displayed in shop windows exposed to the direct rays of the sun.

Squeeze the bulbs; if they are soft they may be infected with bulb fly or possibly eelworm. Make sure the basal plate is not rotting..

Look for gladiolus corms which are coated with a creamy-white dust; they have been treated with fungicides and insecticides. Avoid gladiolus which have black depressed areas or are showing signs of dry rot.

Lilies should be packed in damp sawdust or moss; do not buy if they are exposed.

It is better to avoid all bulbs, corms, and tubers which have started into growth.

* * *

HOUSE PLANTS

The leaves of house plants should be firm with a bright, healthy colour; avoid plants which are dull and dusty, flagging or dropping leaves, green plants which are yellowish or coloured leaf kinds which are poorly coloured.

The pots should be moist and filled to ½ to 1 in. of the top with soil mixture. Do not buy plants which are dry, especially if the soil mixture has set hard or is extremely wet and sodden.

Avoid plants which are displayed in a position exposed to wind, cold, and draughts; also if they are kept in a hot, dry atmosphere (central heating or space heaters), unless the pots are stood on or plunged in damp moss or sawdust to maintain humidity about them.

Buy flowering pot plants such as cyclamen, tuberous begonias, and gloxinias early in the flowering season rather than late in the season just as they are about to go dormant.

Avoid plants which have a mass of roots coming through the drainage hole of the pot. Monsteras, philodendrons, and related species, and some orchids produce aerial roots which come over the sides of the pot. These should not be cut off.

(Continued from page 401)

success, they can be used to replace older or less satisfactory kinds. If they are a failure, no harm is done to the garden, though the pocket may suffer.

TREES AND SHRUBS

Trees and shrubs are the most permanent plants in the garden and special care should be taken when buying them. It is disappointing when they do not grow well and sometimes it is even more so when they grow too well and have to be cut back or removed because they are taking charge.

When buying, get from the nurseryman the following information or find the answers in books or catalogues:

Is it evergreen or deciduous?

What is its ultimate height and spread, its shape, and general growth habit?

What kind of soil does it need?

Does it like a dry or wet position or sun or shade?

Is it hardy and will it stand wind, and, if near the coast, salt winds?

If the desired plant does not fulfil all the conditions dictated by the purpose, site, etc., it should not be bought. If the nurseryman is given full information about the garden, he will be able to recommend a suitable plant.

Trees and shrubs are sold balled, in pots, in cans, and bare rooted.

Balled Plants

Plants sold balled are usually evergreens which have been wrenched during autumn to encourage the production of a mass of fibrous roots, lifted with a ball of soil, and wrapped in hessian or similar material or sometimes in polythene. After wrapping they should be heeled in in damp sawdust to keep the ball moist.

When planting, the hessian is usually removed, and if the roots are bunched, they can be lightly teased out. Sometimes plants are received with the roots coming through the hessian and gardeners are often puzzled about the best way to treat them. If the growth is only slight, it does not hurt to remove the wrapping, but if it is extensive it is better to leave it on. The thick wad of hessian round the stem should be cut away or folded back. Polythene wrapping **must** be removed.

Potted Plants

Small specimens are usually potted and may be in earthenware, cardboard, plastic, or occasionally aluminium or fibre pots.

Plants are sold in this way for three main reasons:

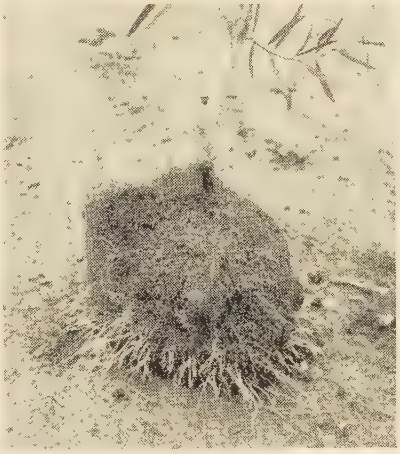
Because they are tender and cannot be planted out from the protection of the nursery into the open in winter and for this reason are often sold outside the normal tree planting season;

Because they do not transplant well and must be shifted with the minimum of root disturbance (for example, many Australian and South African species);

To show the customer what the plant is like when in leaf, flower, or berry.

Potted and balled plants.

▼ Balled plant with roots growing through scrim.



The gardener is able to see exactly what he is buying and to plant when weather and soil conditions are most satisfactory.

When planting, the pots (except the fibre ones) should be removed, the crocks taken out of the bottom of the ball of soil, and if the roots are matted around the outside they should be gently loosened. Plants in fibre pots should be planted as they are. The pot decomposes very quickly. Potted plants should always be thoroughly watered an hour or so before planting.

Sometimes plants which have stood in the plunging bed in the nursery without being moved for a long time have extensive root systems over the top of the pot or through the drainage hole. In general it is better to avoid buying these, especially the latter, for it is almost impossible to remove the pot without damaging the roots. Even if the pot is smashed, the disturbance to the roots when the plant is pulled out of the bed is enough to damage them to the extent that particularly susceptible plants will not live. If these roots are cut off, some plants will collapse immediately, for there are no active roots left in the pot.

Canned Plants

Canned plants are grown in 1- or 2-gallon cans (and sometimes larger) and are usually fairly large specimens. So far only a few nurseries are growing plants in this way, but as the demand increases the number and variety of plants available should improve. For the gardener they have two advantages over the usual balled material; they can be planted at any time of the year and large specimens provide an immediate effect and are especially useful for new gardens being laid out in summer.

The best way to remove the can is to make a cut or cuts down the side and open it out. Plants can be removed from round tins, provided they are not too badly dented, by laying them on their sides and rolling them back and forward, keeping a fair pressure on the tin with the hands. This compresses the soil slightly and allows the plants to be tipped out easily.

Comments about potted plants are equally applicable to canned ones. Particular care must be taken not to let them dry out when planted during summer. They must be watered regularly until established, with their roots well into the surrounding soil.

Bare-rooted Plants

Many deciduous trees and shrubs which do not form a compact, fibrous mass of roots (for example, apples and roses) are sold with bare roots. They are lifted from the nursery rows in late autumn and heeled in in sawdust or soil without wrapping round the roots. There is often considerable root loss when they are lifted and it is usually advisable to shorten back the tops when planting to compensate for this.

Most fruit trees should be pruned back severely, for this first pruning is most important to shape them and form a strong framework to carry fruiting wood. Roses when sent out from the nursery are not pruned but merely shortened back to facilitate handling and packing. They should be pruned back to strong buds and have all weak growths removed. This

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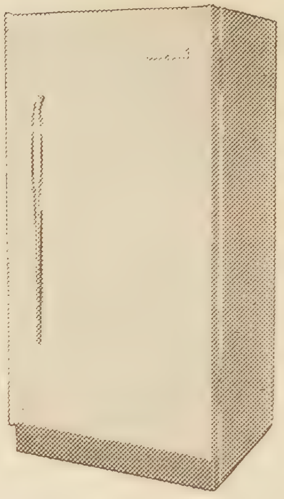

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is best done at the normal pruning time.

Some evergreens, usually hedge and shelter plants, are sold with bare roots. Particular care should be taken in the nursery, the shop, and after purchase that they do not dry out. Most hedge plants (except conifers) should be cut back severely at planting time or soon after to encourage dense, compact growth to ground level.

Some bare-rooted plants, mostly roses, are now being sold with the roots enclosed in polythene bags, sometimes with a little damp straw or moss in them. This gives excellent protection against drying out of the roots and is a practice which could be more widely adopted, especially by shops which do not have facilities for plunging.

SEEDLING PLANTS

Annual bedding plants and some vegetable plants are sold in complete boxes, in smaller quantities out of boxes, pre-wrapped in bundles, in plastic trays and pots, cardboard pots, fibre pots, and wood veneers.

Most seedlings will stand much bad treatment and still live. Some may even grow into satisfactory plants, but if quick growth and really first-class plants are wanted, good plants should be bought and given the best treatment. A good plant is one which has a good root system with a well developed top. Plants bought in boxes, plastic trays, pots, and veneers have the advantage that they can be held for days if necessary and planted out when soil and weather are ideal.

HERBACEOUS PERENNIALS

Height and spread of herbaceous perennials should be known before they are bought so that they can be planted in the most suitable position in the bed or border. Many grow rampantly and soon take charge if not kept well in hand. Many will not grow well in the warmer parts of the country, especially on lighter, drier soils. Check their suitability for particular soil and climatic conditions.

BULBS, CORMS, AND TUBERS

As bulbs, corms, and tubers are usually sold when completely dormant, faults and diseases are not so easily seen.

HOUSE PLANTS

An article on the care of house plants and the choice of plants for particular positions and conditions appeared in the December 1960 issue of the "Journal".

Flower Garden Work for May

Planting

Continue planting deciduous trees and shrubs when the ground is not too wet. If the soil is wet and sticky, the plants can be heeled in and can be held this way for a considerable time. Dig a shallow trench on a **well drained** part of the section and place the shrubs so that the roots can be covered with soil and kept moist; normally the plants should slope at an angle of 45 degrees toward the south to reduce wind and sun damage. Water if necessary during a dry spell.

If the roots of shrubs are very dry on arrival, place them in a bucket of water for a few hours before planting.

By JOY WATKINS,
Horticultural Advisory Officer,
Department of Agriculture,
Auckland

Stake shrubs and trees securely with a stout manuka or similar stake. The stake can be driven in before planting. Stakes treated with "Metalex" or similar preservative will not rot as quickly as untreated wood. Do not use creosote, as this can damage plants. Tie the shrub or tree to the stake, making a twist to act as a buffer between the two. Nylon stockings make soft, strong ties. If cord is used, place sacking or other material between the tie and the plant to prevent damage to the bark.

Check and replace ties and stakes on established plants.

Routine Work

Weed beds of winter-flowering bulbs regularly. If weeds are removed when they are small, there is less disturbance of the bulbs. If anemones are choked with weeds or disturbed by the removal of large weeds, they will not flower well, both the quality and quantity being affected.

Cut back dahlias and lift if there is the possibility of frost. The ground can then be dug over and well manured before replanting. Dust stored dahlias with DDT to control slaters, and cover with a thick layer of newspapers to keep out frost.

Continue to dig vacant ground, mixing compost into the top spit and liming the surface if necessary.

Untreated shavings and sawdust used on paths during summer can now be dug into the beds alongside, as they are partly rotted. Place fresh untreated sawdust on pathways to prevent compaction of the soil during winter. This is very valuable alongside beds of winter flowers such as anemones and daffodils.

If possible, place all garden furniture under cover for winter. When thoroughly dry it can be repainted. Clean and sharpen all garden tools and equipment. Wipe with an oily rag any which will not be used again until next spring.

Clean spraying equipment with a detergent solution, stand overnight, and flush out with clean water. Check washers and hoses and replace where these are worn or perished.

If new spraying equipment is to be purchased, consider the use of a diluter attached to a hose. This attachment injects a predetermined amount of spray chemical or liquid fertiliser into the hose water.

Other types of domestic spray machinery are the small hand atomiser, syringe, stirrup pump, and knapsack.

Winter prune deciduous shrubs, removing dead and diseased wood and any exhausted branches. Shrubs which flower on young wood can be pruned hard, cutting back growth made last season to within a few buds from the base, for example, buddleia, erythrina, caryopteris, lantana, lagerstroemia, luculia, and poinsettia (after flowering).

Prune half the length of last season's growth from hydrangea, cutting away less if the bush is in the shade. Where hard frosts are experienced delay pruning of hydrangeas until spring.

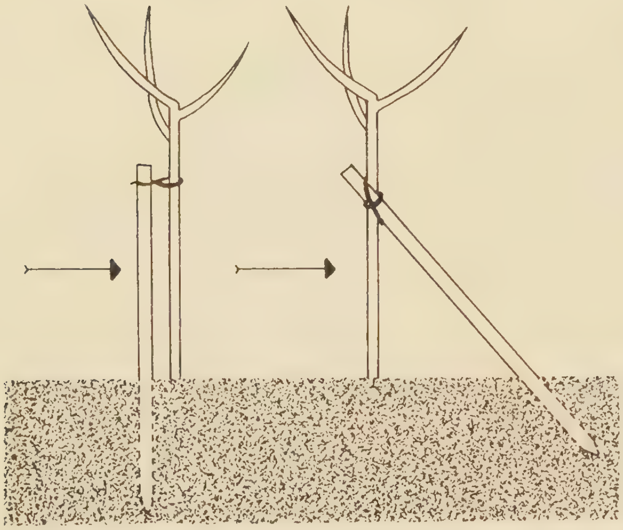
Onion Weed

Onion weed is increasing rapidly in some districts and attempts to control it when in flower are largely useless, as it is more resistant to weedkilling spray materials at that time. Onion weed is best controlled when between 3 in. and 6 in. high, using 2,4-D at 1 fl. oz. to 40 sq. yd. The 2,4-D should be mixed with diesel fuel at 1 part of 2,4-D to 20 parts of diesel fuel, which should be sufficient to give a complete foliage cover. A larger quantity of diesel fuel may be used if required.

The 2,4-D is most damaging to trees, shrubs, flowers, and vegetables, particularly roses, vines, and tomatoes, so spray with great care on a still day, applying only sufficient to wet the leaves without run-off. Spraying equipment should not subsequently be used for any purpose other than weedkilling. Repeated spraying will probably be needed to eradicate this weed.

Replanning of Garden

Some small re-organisation may make a great difference to the ease of



Method of staking trees when the prevailing wind (see arrow) is moderate (left) and strong (right). Cut a strip of nylon 1 in. or more wide in a long spiral from an old stocking. Tie in a figure eight round tree and stake.

upkeep of a garden. Concrete or tar-sealed paths need no weeding, but all weeds should be cleared before tar-sealing; otherwise they will grow through it. Any soil sterilant weed-killer normally recommended for paths and waste places (CMU, dalapon-amitrol mixtures, or simazine) is suitable if used at the heaviest recommended rate. Shrubs and trees planted in grass are less trouble than herbaceous borders.

Fruit trees and some shrubs should receive regular spraying and manuring, but many decorative trees and shrubs need little attention. Among these are rhododendron, pohutukawa, kowhai, birch, cistus, camellia, forsythia, viburnum, and magnolia.

Rocky banks covered with strong-growing climbing or trailing plants need only an annual trimming, whereas a rock garden must have constant care.

On clay soils, flower or vegetable borders which are **narrow** can be attended to from the path or grass on either side even when the soil is too wet and sticky to be walked on.

A large area of grass, unbroken by flower beds or shrubs, is easy and quick to mow and often improves the appearance of a small section. With a good specimen tree to provide shade, and banks of shrubs at the boundaries making an informal hedge or shelter, the section will look restful but not uninteresting. If it is desired to have a border of flowers, a raised bed with retaining walls broad enough to sit on will be easier to look after. On poorly drained soil such a bed will allow the cultivation of plants such as gerberas, carnations, and many shrubs which would otherwise be difficult to grow.

Glasshouse and House Plants

Water plants in the morning so that any surplus has evaporated before evening. Plants which are kept slightly dry are better able to withstand cold conditions.

Close ventilators early in the afternoon to conserve sun heat.

Move frost-tender house plants away from the windows at night, as the temperature drops lower close to the glass.

Floral Decoration

Dried material and that which has been preserved with glycerine and water can be most useful now. The effect of an arrangement is often enhanced by placing it on a suitable polished wood or matting base. Skeleton or painted leaves may add to the interest of a design. Leaf skeletons of magnolia, karaka, and other shrubs may be found naturally, or they can be produced by boiling mature leaves for a short time in a strong solution of caustic soda, when the layers of leaf peel off, leaving the veins intact. Wash thoroughly in clean water before handling.

Poinsettias are coming into flower. The easiest way of ensuring that they take up water and do not wilt is to place the cut stems, with most of the leaves removed, in an earthenware or metal container and pour in very hot water. A sink or bucket is convenient for treating a lot of flowers with long stems. Winter roses respond to this treatment too, but only the bottom inch of stem should be immersed. Leave until the water is cold before arranging. Another method of treating winter roses is to place the whole flower and stem under cold water for a few hours, keeping them under with a layer of crumpled newspaper.

Violets will last one to three weeks if they are completely submerged in water each night and left under water until the morning. If tied in a bunch, the bunch is easily inverted in a deep bowl of water each night.

Foliage of pines and evergreens and rosettes of succulent plants add to the variety of colour during winter. Sprays of macrocarpa hedge bleach to pleasant tawny shades if cut and placed on grass and covered with a thick layer of damp sacking.

Camellias are coming into flower. Cut the blooms carefully, as they bruise easily, the petals becoming brown wherever they have been touched.

Books

Books of garden plans and plants for California and Australia are most likely to be helpful in the warmer parts of New Zealand, as conditions of climate and way of living are comparable.

Gardening books written for readers in England are of value in the South Island, but may be very confusing due to the difference in seasons. The practice of following directions for sowing or planting, but adding six months to the recommended day, can be very misleading.

In most parts of New Zealand the equivalent of 1 June in England, when it is reasonably safe to plant tomatoes and other frost-tender vegetables and flowers in the open, is during the last week in October.

The cold weather which puts an end to most summer crops comes in New Zealand about mid April, though in in some years it may begin at mid March. This is roughly equivalent to the end of September or early October in Britain.

Suggestions for Reading

"Handbook of Trees and Shrubs for the Southern Hemisphere", R. E. Harrison (A. H. and A. W. Reed, Wellington), 1960.

"Handbook of Bulbs and Perennials for the Southern Hemisphere", R. E. Harrison (Keeling and Mundy, Palmerston North), 1953.

"Australian Plants for the Garden", T. Y. Harris (Angus and Robertson, Sydney), 1953.

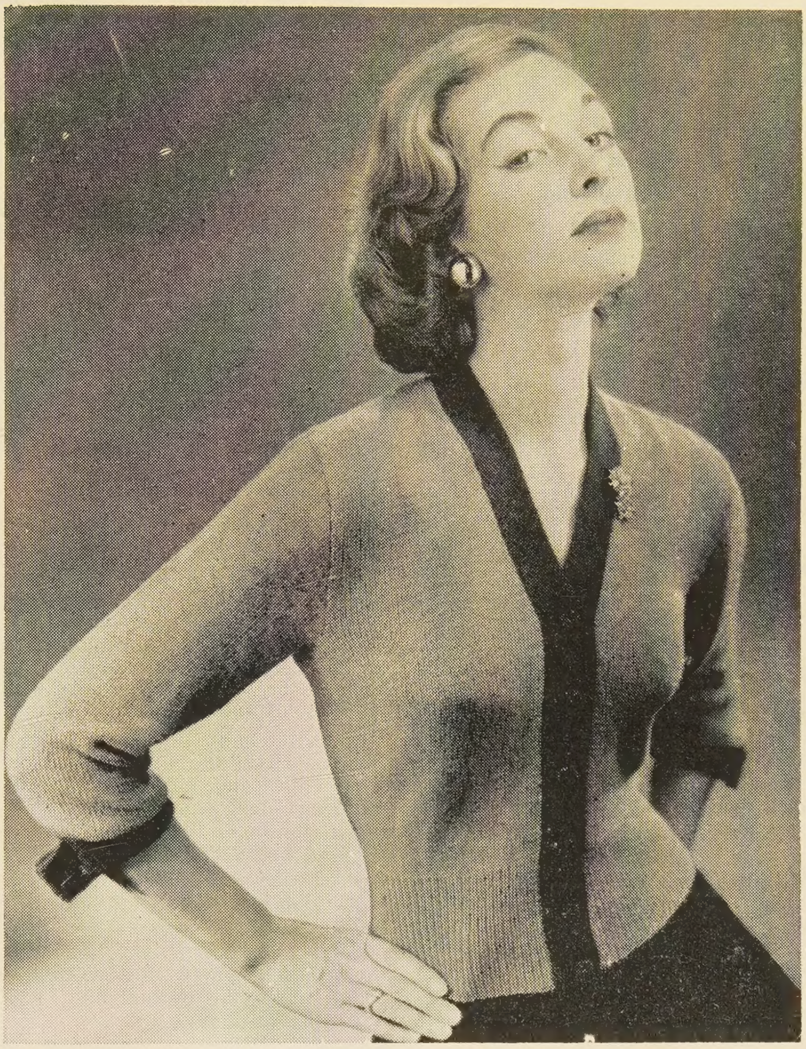
"Flowering Shrubs and Trees for South African Gardens", S. Eliovson (H. Timmins, Cape Town), 1953.

"Sunset" series (Lane Publishing Company, California): "Sunset Western Gardening Book", "Sunset Seasonal Garden Guide and Record Book", "How to Grow African Violets", "How to Grow Roses", "How to Grow Camellias", "Landscaping for Western Living", "Sunset Pruning Handbook", and "Colour in Your Garden".

Reed's Garden Guides (A. H. and A. W. Reed, Wellington): "Roses for New Zealand Conditions" (Frank Mason), "Outdoor Carnations and Gerberas in New Zealand" (J. A. Robinson), "The Simple Garden" (E. O. Petersen), and "Pruning for New Zealand Conditions" (E. O. Petersen).

Classic Cardigan with Contrasting Border and Cuffs

SIMPLICITY of design very often achieves the most striking result, a fact well emphasised by the cardigan illustrated here. Of classically simple line and with contrasting border and cuffs, the finished garment is very attractive.



ABBREVIATIONS: K., knit; p., purl; st., stitch(es); st.st., stocking st. (1 row k., 1 row p.); cont., continue; inc., increase(ing); dec., decrease(ing); tog., together; beg., beginning; foll., following; mn., main; c., contrasting; rep., repeat.

Materials: 6oz. of 3-ply wool in main colour; 2oz. of 3-ply wool in contrasting colour; 2 No. 12 and 2 No. 10 knitting needles; 6 buttons for front, and 4 buttons for sleeves.

Measurements: Length, 20in.; bust, 36in.; sleeve seam, 11½in.

Tension: 7½ st. to 1in. on No. 10 needles; 8½ st. to 1in. on No. 12 needles.

The Back

Using No. 12 needles and mn. wool, cast on 112 st., and work 4in. in k. 1, p. 1 rib.

Change to No. 10 needles and cont. in st.st., inc. 1 st. at both ends of the 5th and every foll. 6th row until there are 134 st. Cont. straight in st.st. until work measures 12in., ending with a p. row.

Shaping the Armholes

Cast off 6 st. at beg. of next 2 rows, then dec. 1 st. at both ends of every row until 104 st. remain.

Cont. straight until work measures 20in., ending with a p. row.

Shaping the Shoulders

Cast off 12 st. at beg. of next 4 rows, then cast off 11 st. at beg. of next 2 rows.

Cast off remaining stitches.

The Right Front

Using No. 12 needles and mn. wool, cast on 50 st.; using c. wool, cast on 25 st.

1st row: K. 25 c., * p. 1, k. 1 mn. Rep. from * to end.

2nd row: * P. 1, k. 1 mn. Rep. from * to last 25 st., p. 25 c.

Rep. last 2 rows once. (To prevent holes between mn. and c. work twist wools at back of work.)

Make a double buttonhole in next 2 rows thus:

Next row: K. 5, cast off 3 st., k. 9, cast off 3 st., k. 5, rib to end.

Next row: Rib to the last 19 st., p. 5, cast on 3, p. 9, cast on 3, p. 5. (5 more buttonholes are worked in front border thus: 2 more in the welt at intervals of 1¾in. from cast-off edge of previous one, and 3 others at intervals of 2½in. from cast-off edge of previous one, measured on mn. work, without further instructions).

Keeping front border in c. wool and st.st., cont. in rib on remaining stitches until work measures 4in., ending at front edge.

Next row: K. 25 c., change to No. 10 needle, k. mn. to the end.

Next row: P. mn. to the last 25 st., change to No. 12 needle, p. c. to the end.

Keeping 25 border st. on No. 12 needles and c. wool throughout, cont. in st.st. on all st., inc. 1 st. at the end of the 3rd and every foll. 6th row until there are 86 st.

Cont. straight until work measures 12in., ending at side edge. (About ½in. should have been worked after last buttonhole.)

Shaping the Armhole and Front Edge

1st row: Cast off 6, p. to end.

2nd row: K. 25, k. 2 tog., k. to last 2 st., k. 2 tog.

3rd row: P. 2 tog., p. to end.

4th row: K. to last 2 st., k. 2 tog.

Rep. last 2 rows once, then 3rd row once again.

8th row: As 2nd row.

9th row: As 3rd row.

10th row: As 4th row.

This completes the armhole shaping.

Cont. to shape front, dec. 1 st. inside front border on the 4th and every foll.

CLASSIC CARDIGAN . . .

6th row until 60 st. remain. Then cont. straight until work measures 20in., ending at armhole edge.

Shaping the Shoulder

Next row: Cast off 12, work to end.

Next row: Work to end.

Rep. last 2 rows once.

Next row: Cast off 11, work to end.

Work a further 2in. on remaining 25 border st. Leave stitches on a spare needle.

The Left Front

Using No. 12 needles and c. wool, cast on 25 st., using mn. wool cast on 50 st.

Next row: * K. 1, p. 1 mn. Rep. from * to last 25 st., k. 25 c.

Next row: P. 25 c., * k. 1, p. 1 mn. Rep. from * to end.

Rep. last 2 rows until work measures 4in.

Change to No. 10 needles for mn. part and keeping border st. in c. wool and on No. 12 needles throughout, cont. in st.st. on all st., inc. 1 st. at beg. of 5th and every foll. 6th row until there are 86 st.

Now complete to match the right front, reading k. for p., and p. for k. Graft together the two sets of 25 st.

The Sleeves

Using No. 10 needles and mn. wool, cast on 76 st., and work in st.st., inc. 1 st. at both ends of the 7th and every foll. 8th row until there are 98 st.

Cont. straight until work measures 10in., ending with a p. row.

Shaping the Top

Dec. 1 st. at both ends of the next and every alternate row until 68 st. remain, then dec. 1 st. at both ends of every row until 40 st. remain.

Cast off 4 st. at beg. of next 6 rows.

Cast off remaining stitches.

The Cuffs

Using No. 12 needles and c. wool, cast on 86 st., and work ¾in. in st.st., ending with a p. row.

Next row: K. 4, cast off 3, k. to the last 7 st., cast off 3 st., k. 4.

Next row: P. 4, cast on 3, p. to the last 4 st., cast on 3, p. 4.

Cont. in st.st. until work measures 2¼in., ending with a p. row.

Make buttonholes in next 2 rows as before, then work ¾in. more in st.st. Cast off.

To Make up

Press the work with a hot iron over a damp cloth. Join the side, shoulder, and sleeve seams and sew in the sleeves. Sew the lower edge of the border to the back neck edge. Turn the border in halves and slip st. to back of the work. Sew round double buttonholes and sew on the buttons.

Fold the cuffs in halves with the right sides inside and stitch along the short edges and for about 1in. along the long edges (as far as the end of the buttonhole). Gather the sleeve edge to fit the cuff, leaving the 1in. free at each end. With the right side of the cuff facing the right side of the sleeve sew one edge of the cuff in position, then turn over and slip st. the other edge on the wrong side. Stitch round the buttonholes. Fasten with link buttons.

Vinegars for Different Foods

VINEGARS are as different as the foods they season and should be used accordingly to highlight flavours.

Cider vinegar is the all-purpose vinegar favourite for salads and salad dressings, though distilled white can be substituted in preserved fruits and vegetables. It sometimes darkens the colour of foods or causes shrivelling during storage.

Distilled white is the best vinegar for pickling and preserving. Its delicious aroma accents the true flavour without being overpowering.

Tarragon seasoned with herbs, is considered the epicurean vinegar. It should be used sparingly, as it has a distinctive flavour. It is good in French dressings and meat or fish sauces. It can be substituted for cider vinegar in meat, fish, or egg salads.

Malt is considered by many to be the best vinegar. It gives zest to hearty meat, fish, or cereal dishes. Because of its rich, full-bodied flavour, it should be used sparingly to retain the flavour of the original food.

—GWYNNETH V. BOSTOCK,
Home Science Instructor,
Department of Agriculture,
Palmerston North

Milk Needs V.I.P. Treatment

MILK is a very necessary article of diet because of the food essentials it contains, but it is also an excellent breeding ground for all kinds of bacteria.

Pasteurised milk has been treated to kill all disease-producing bacteria and is distributed in bottles sterilised according to stringent regulations laid down by the Department of Health. It would seem, therefore, that the most satisfactory way to use milk would be straight from the bottle, or, if this is not acceptable aesthetically, to pour into a scrupulously clean jug only what is needed for immediate use and never to pour any unused milk back into the bottle.

Milk should not be left exposed to sunlight, or the small amount of vitamin C it contains will rapidly disappear. Bottles of milk should be taken in from the gate and placed immediately in a ventilated cool safe or refrigerator. Brown glass bottles give more protection to the vitamin C content of milk, but because of lack of consumer appeal they have been withdrawn from use.

—MAUD B. STRAIN,
Home Science Instructor,
Department of Agriculture,
Dunedin

Friday Fare

THE following recipe for a fish dish is delicious. You make it, bake it, and serve it—all in the same dish.

Baked Fish

1 cup of chopped onion
½ cup of chopped celery and tops
½ cup of chopped parsley
2 lb of fish fillets
1 teaspoon of salt
⅛ teaspoon of pepper
¼ cup of vegetable oil
1 teaspoon of paprika
2 8 oz tins of tomato soup

Combine onion, celery, and parsley. Arrange in a large, shallow, greased baking dish. Place fish in overlapping layers over the vegetables. Season with salt and pepper.

Pour the oil over the top and sprinkle with paprika.

Bake in a moderately hot oven (375 degrees F) for 10 minutes.

Pour the tomato soup over the fish. Bake 30 to 35 minutes longer, or until fish is flaky and the soup bubbles. Baste fish frequently with the soup. Serves four.

—JANET W. ROBERTS,
Home Science Instructor,
Department of Agriculture,
Auckland

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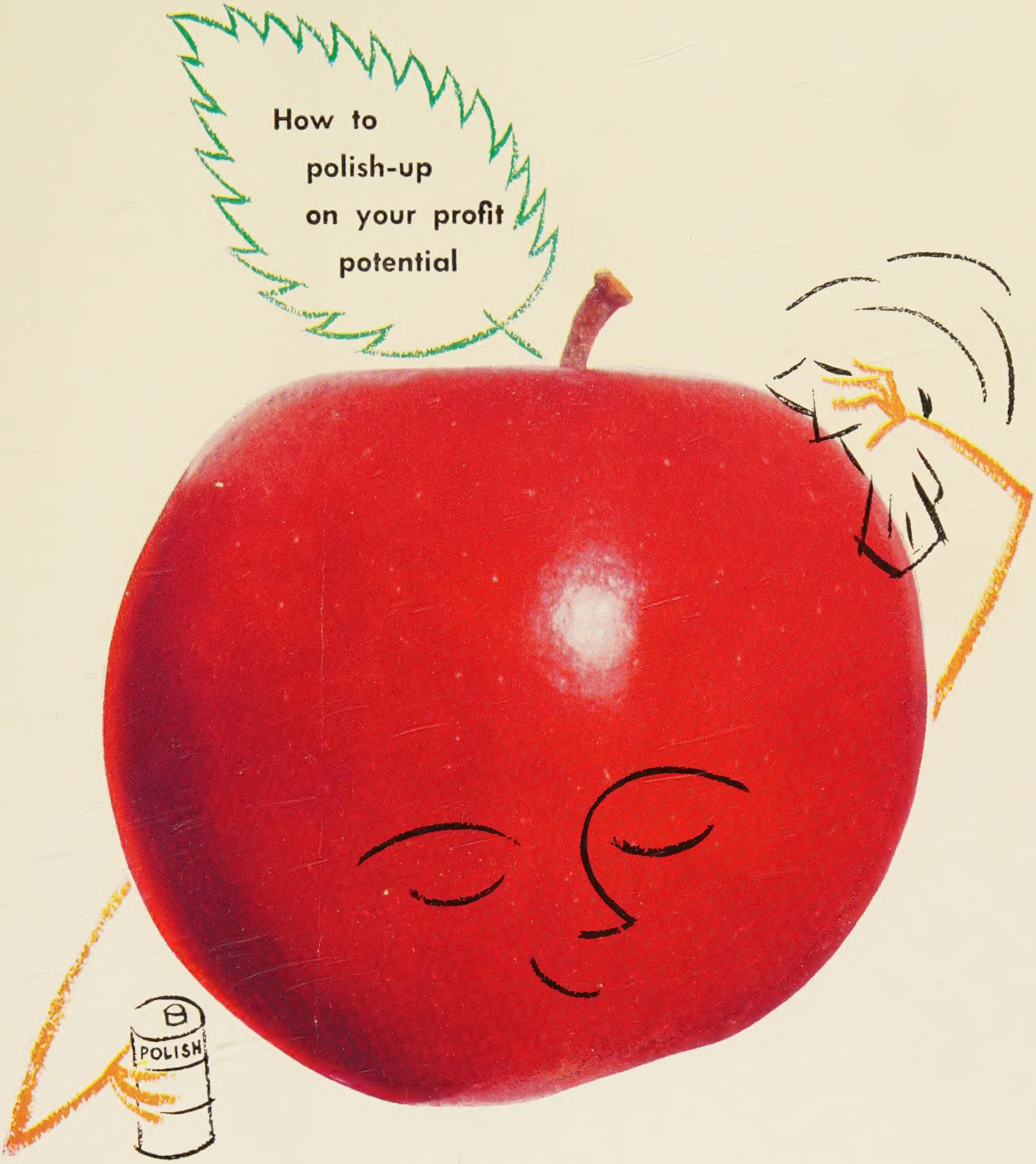
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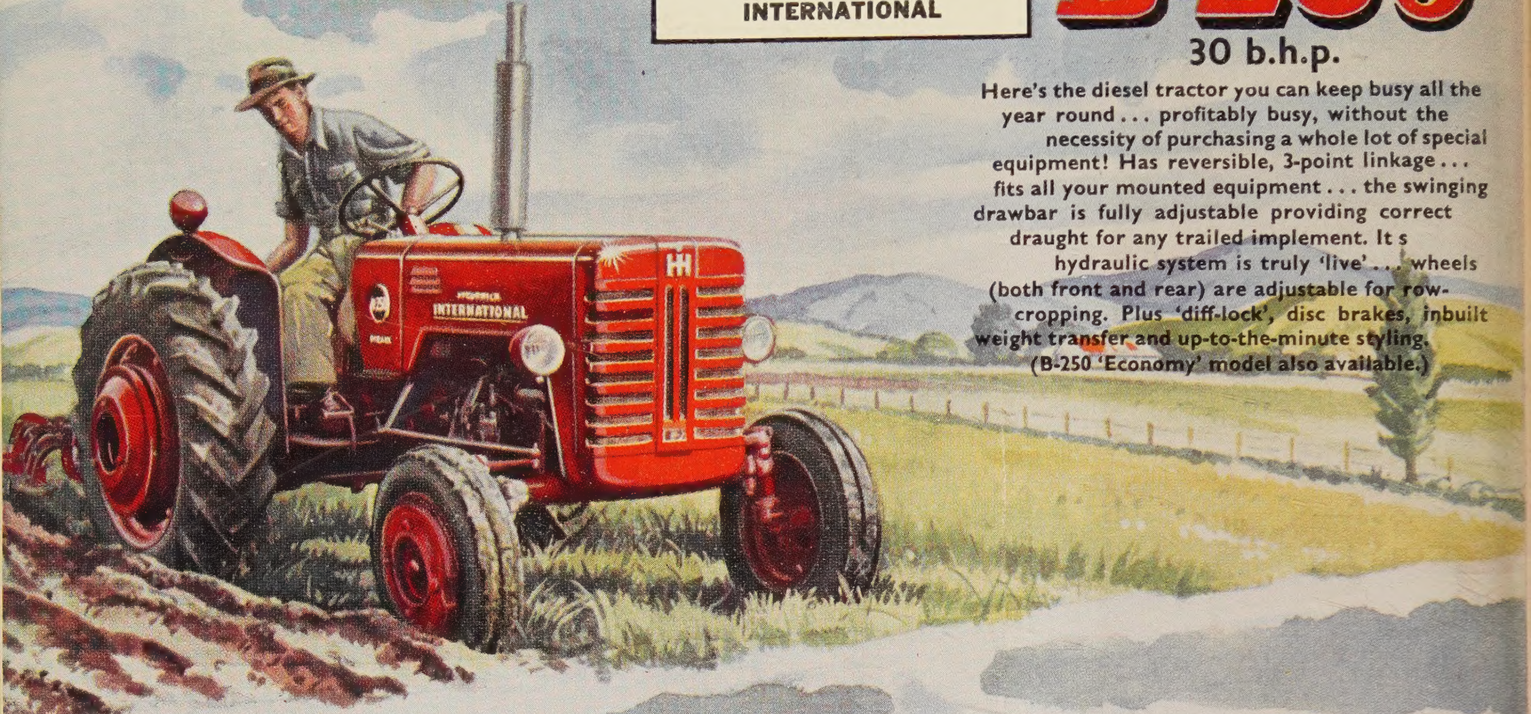

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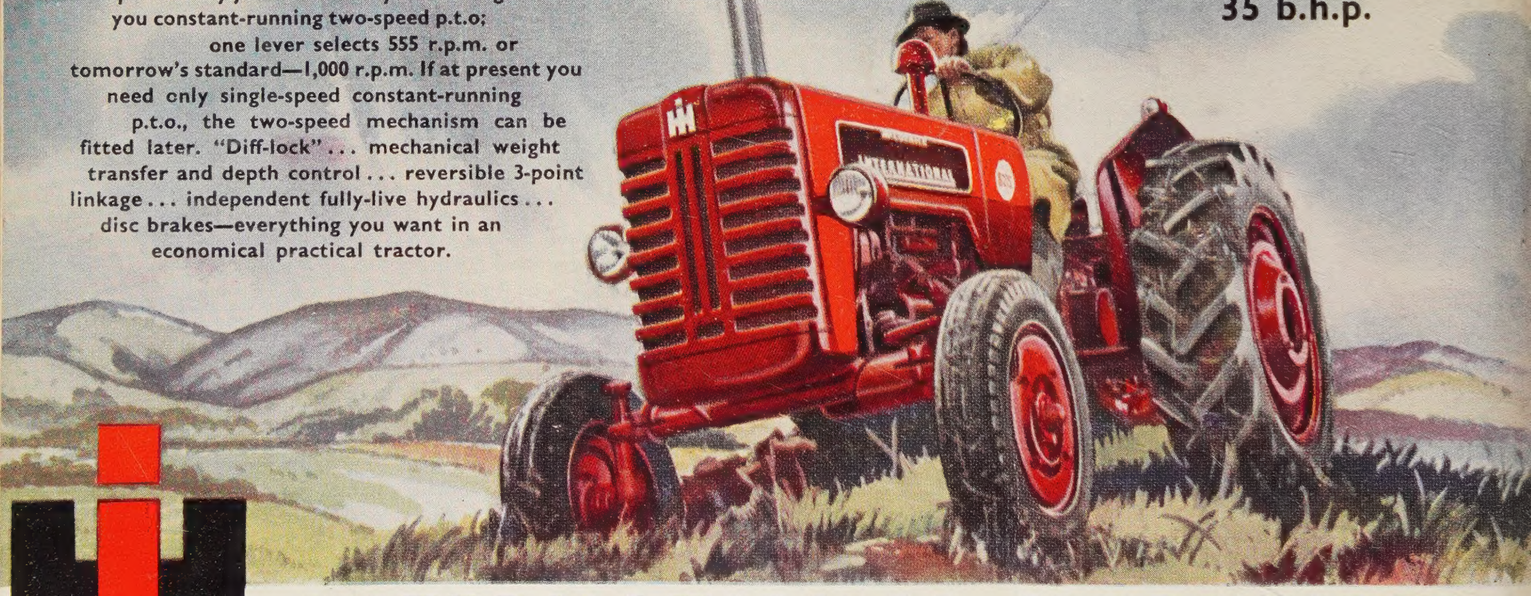

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